WORK

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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A CABINET IN FRET-CUTTING.

An Art-Work for Skilful Workers.

BY J. W. GLEESON-WHITE.

THERE are, it is sad to remember, some amateurs in fret-cutting whose method (or lack of it) is to trace their pattern within one-sixteenth of an inch of its outline or thereabouts, and then paste the design upon a rough piece of wood from a cigar-box, cut it vaguely within another one-sixteenth of an inch of the tracing (this only gives an eighth of an inch away from the line, really a very fair result, as they take it sometimes in excess, sometimes less, so it comes all right in the end), then, having pulled off the tracing with the help of a moist finger and a blunt pocket-knife, proceed to make it up, with one white tin tack, one blue one, and a good big crack across the fretwork itself, and stand enraptured at the result—a bracket, say, that only cost one shilling for pattern, saws, and wood, and is worth less than the least valuable thing in the universe.

To such as these I speak not, nor even to the patient schoolboy who spends untold energy and turns out most creditable fretwork, yet contents himself with such rudimentary joinery that, however excellent the actual sawing of his design when his work is done, it is merely "fretwork." This design must be finished by a good joiner, whether by the amateur himself or passed over to a professional matters not, so long as it is well done, for this cabinet is distinctly *not* worth doing badly—few things are for the matter of that; and unless the would-be maker is willing to devote skill and care beyond the usual run, he had better select another of the many patterns available, and, saying, "That thing! why, it is not worth cutting; look at all the small holes the idiot has put in it!" or some such graceful word, bid it depart from his sight, for he will have none of it.

Yet, though the work involved is not to be rapidly done, the gossip about it may be short. It is intended that the fretwork be worked in duplicate in very thin ebony, or in wood stained black after cutting, and mounted afterwards on holly or other white wood; both being polished before being glued together, of course. The fretwork may be cut two pieces at a time; this reduces the sawing by half, and yields facsimile replicas of the pattern. The rest of the framework to be of ebonised wood polished, with appropriate mouldings of fine, neat design. If the four smaller panels can be worked to drawer fronts it will be much better; but, in lieu of that, cupboards will suffice.

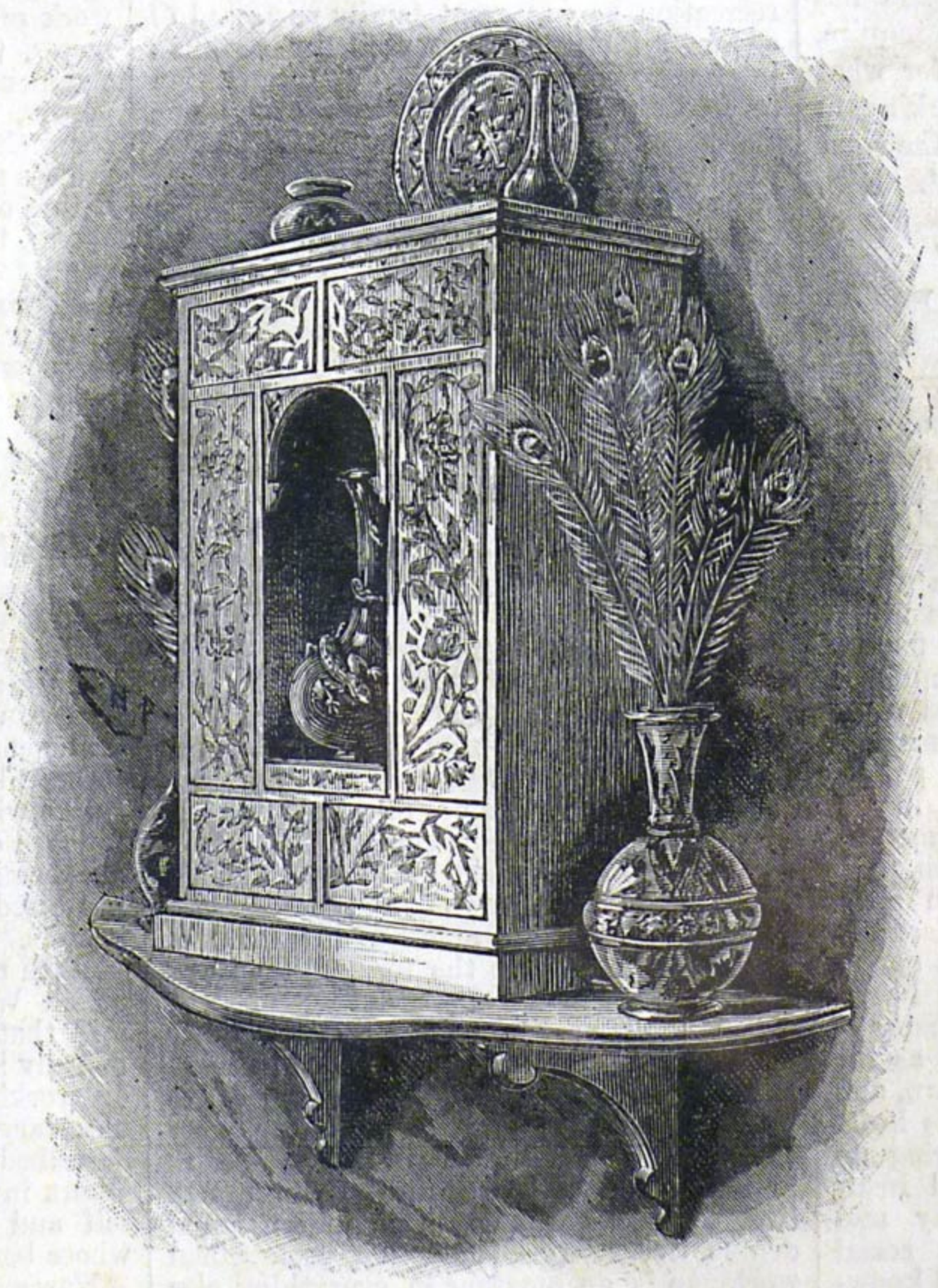
For inlay—and by that I mean the usual plan of replacing the cut pieces of wood in the holes from which they came—an alternative half of the design is shown much modified in its details. For since in this case the necessary perforations drilled in each cut-out piece to admit the saw can hardly be arranged so deftly—always at the point of an angle—that when each piece is replaced they are no blemish to the work, it will be better to reverse this arrangement of the wood. That is, to work as usual the whole design in white wood, staining the cut-out pieces with Stephens' ebony stain. These should be carefully replaced, and the holes stopped with a mixture of sawdust and glue before polishing, the whole surface being glued to a thin backing of hard wood. If the one who suggests it may say so, I do not think this plan would be so effective, although more genuine in some respects.

As a practical hint, I would suggest lining the wood with newspaper and replacing the pieces from the back, when the puzzle—for such it is—will be greatly simplified by the clue afforded in the printed matter. For the first method, knowing how easily white wood darkens with age, whether polished or plain, it may be that a coat of fine white enamel paint would be better for the under part. It is possible that if the cut and polished wood were laid over the varnish paint when wet, and left under a heavy pressure, that the junction would be as firm as glue. It would certainly avoid the danger of the glue oozing beyond its place and staining the visible parts of the design.

The framework of the cabinet being pure joinery, I need not speak of it here; more skilful cooks attend to the joints in our *menu;* my business is to provide the *entrées* and sweets only, and, as too many of the former is a proverbial danger, it is safest to leave the others to explain the serious part of the programme, as they are so well able to do.

It may be best to repeat the advice of absolutely perfect finish, so far as in this imperfect life such a thing is obtainable. For very many ornamental objects, whether carved or painted, a certain roughness and irregularity of handling gives a real artistic value, lost in merely "niggling" precision and absolute accuracy of detail. But for a cabinet on so small a scale, and in the style of symmetrical design chosen, an almost mechanical rigidity of correctness and unstinted labour to attain the very best result practicable must be exacted; then the amateur may put his work beside that of the skilled artisan with no fear of the contrast, since, in an art so mechanical as fretwork, the individual temperament of the artist that tells so largely in wood carving is practically unfelt.

In the illustration given in this page is shown a perspective view of the cabinet when completed and placed on a moulded shelf specially prepared for its reception.



Perspective View of Cabinet in Fret-Cutting.

(For Full-Size Working Drawing of Front, see Pattern Sheet presented with this Number.)

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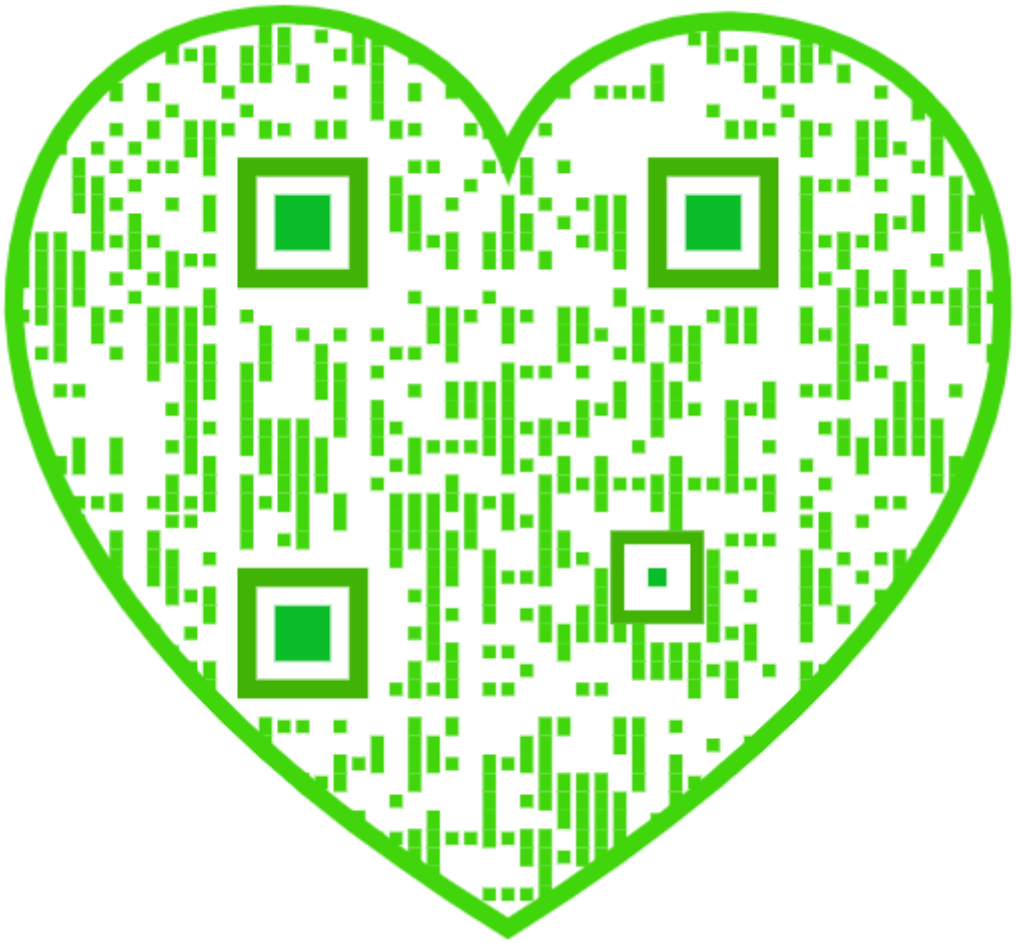

WORK.

An Illustrated Magazine of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

TO OUR READERS.

"Read you, and let us to our WORK."
2 King Henry VI., i. 4.

ALTHOUGH no apology may be needed for the appearance of WORK, an explanation of its Why and its Wherefore—its *raison d'être*, as our friends across the Channel would put it—is certainly desirable, and a little space in this, its first Number, may be usefully taken up in showing the causes that have led up to its introduction; the persons to whom it chiefly appeals; the objects at which it aims; the special features by which it will be marked; and the field of operation that it seeks to cover.

First, then, let it be shown *why* and *wherefore* WORK has been called, and has come, into existence. What, let us inquire, is the great demand of the time; for what are most men chiefly asking and seeking in the present day? To this question the right reply is by no means difficult to find. It is, and must be—"Better and fuller means of Technical and Practical Education."

Never, indeed, it may be said, was the demand for technical education greater than it is at the present time! Never was it heard more loudly than it is now among workmen of British nationality! And why? Simply and solely because of late years it has become painfully apparent that by means of increased facilities for obtaining technical knowledge the foreign workmen have been stealing a march upon them. Never, forsooth, at any time has the necessity for sound technical education for the workman been so thoroughly impressed upon the minds of men as now; and never has it been so eagerly desired and demanded by all grades and classes of the people. At the present moment there lies in the pigeon-holes of the British Government a Bill for the Promotion, Extension, and Elaboration of Technical Education in the United Kingdom, which will be discussed and moulded into law at the earliest opportunity. Our Universities and great Public Schools are awakening to the necessity of teaching the hands to work as well as the brain to think. In every large town, and in London itself—the head as well as heart of the Empire—a craving is springing up for the establishment of technical institutes and workshops, in which any and every man, whatever may be his social station in life, may obtain improved knowledge of the leading handicrafts that are practised by men, or even to learn their very rudiments, if he so require. In these amateur workmen are already assembling, that they may better know through practice under trained teachers how to carry out the work they may have adopted as a hobby; and professional workmen that they may become better conversant with the theory that underlies the work they do; and by this, and a quickening of their taste and perception of the beautiful in form and perfection in execution, gain greatly in skill, and capacity for carrying out the work by which they have to live. And all grades of workmen are alike led to seek self-improvement, because they have realised the truth of the grand old saying—*Knowledge is Power*.

To meet, then, at a most critical period of our national existence, the needs of workmen belonging to each and both of the two great classes into which workmen are naturally divided—professionals on the one hand, and amateurs on the other—WORK has been brought into being. That WORK will prove the most useful and most complete serial of its class that has yet been given to the world, there is every reason to believe; and, without doubt, it will be eagerly sought after, read, and followed by those for whose benefit it has been produced, as the first, the best, the most helpful, and the most reliable practical instructor of the times in which we live. Nay, more than this, it may be regarded as being verily unique in itself through the comprehensiveness of its scope, for, although efforts may have been made, prior to this, to help and instruct the amateur, never yet has any attempt been made to regard all workmen, whether workers for gain and daily bread or workers for amusement and recreation, as one great family possessed of common aims and actuated by common interests, who enter the lists of competition in friendly rivalry alone, to provoke one another to the execution of work of greater excellence than either the one or the other has as yet produced. Each class has much to learn of the other; each class can teach the other much. Time it is to be up and doing, and, with regard to those who write in the pages of WORK, it is to lead and help their fellow-men to better things that they are banded together. They, verily, are first afield to guide where guidance may be needed, and to give assistance and lend a helping hand wherever aid may be sought. And this they will ever do in the spirit of Solomon's mingled counsel and command—"*Whatsoever thy hand findeth to do, do it with thy might.*"

Mention has been made, well nigh in the same breath, of the amateur and the professional workman; but are they not more closely akin than superficial thinkers are disposed to allow? Are not all men amateurs alike? Are not all professionals? Verily, yes; each and every man in his own order. What, indeed, is the difference between workmen, amateur and professional, save that the latter practises his craft or calling for gain, and the former loves and cultivates an art for his amusement. The distinction is very much like that which has been drawn from time immemorial between those who live to eat and those who eat to live; and the comparison runs far more closely in parallel lines than may appear at first sight, for if the professional works to live, does not the amateur in an equal degree live to work? Even a professional workman is an amateur in everything else except the one particular handicraft by which he lives; so that, speaking fractionally, every man, if he be one-fourth professional, is very likely three-fourths amateur, and so may be regarded as being in point of fact more of an amateur after all than he is of the professional. Said a working man to the writer one day, "I look upon myself as an amateur in every man's trade except my own, and as I like to know something about all trades besides my own, I hail with pleasure every source from which I can derive some knowledge of them." Every man, indeed, has, or ought to have, his hobby whether he be professional or not, and therefore, in seeking to administer to the improvement of one class and to build up and augment the knowledge of its members, precisely the same thing is done in the interests of the other.

This has been said to show that the pages of WORK are intended for both groups of workmen alike, and to point out, on the good old principle that what is sauce for the goose is sauce for the gander, that that which is desirable and useful for one group to know is equally useful and desirable for the other. If there be any difference at all, it will be found to consist chiefly in this—that the professional workman requires and desires to gain in comprehension of theory, and the amateur, conversely, in practice, and thus each will be brought on *pari passu* to the same goal—perfection in execution.

We must now pass on to consider briefly the objects of WORK, and the subjects that are to receive treatment in its pages. On this it is only necessary to say that in the papers which will appear from week to week will be found a clear and practical exposition of the *modus operandi* to be followed in every art, craft, or science that bears, either directly or indirectly, on handiwork of a constructive or decorative character, the directions being supplied and comments made, either in short single papers, or in series of articles tersely and comprehensively written. If the reader presses for a more accurate definition of the nature of the articles that will be treated in WORK, let him attempt to sum up in his mind for a moment the handicraft trades that are most familiar to himself, and endeavour to realise that instruction will be given on, or notice taken of, every one of them sooner or later. To catalogue them would be simply to make a list of every kind of constructive and decorative work that is practised by man. Let us take this as done, and so avoid the waste of time, space, and power that would be involved in its preparation. Number 1 and Part 1 will sufficiently serve as samples of the whole. It is impossible, manifestly, to touch on everything at once, but everything, nevertheless, will be touched on in time.

In general character, WORK will be purely technical and instructive. Nothing that comes within the region of polemics will be touched on in its pages, and discussion will be permitted on such subjects only as are possessed of common interest for all readers.

With reference to the special features by which WORK will be marked, it may be said that every paper that requires it will be fully illustrated with sketches, diagrams, or working drawings to scale, as may be necessary, of the articles and processes described. This alone will tend to render WORK invaluable both to the workman himself and those at whose bidding and for whose benefit he may work.

New machinery, new tools, new appliances, new arts, new processes, new modes of treatment will always find exposition in its pages, and a special feature will be made of

OUR GUIDE TO GOOD THINGS,

in which notice will be taken of tools, machinery, technical works, etc., and all things useful and novel that manufacturers and inventors may produce in the interest of those who labour with the hands. Manufacturers and others are requested to send the Editor timely notice of any new tool, machine, or appliance that they are about to introduce as a new claimant for public favour.

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It is open to question if there exists a single workman, professional or amateur, who has not, at some time or other, desired to seek information on points connected with his trade or hobby. For the satisfaction of these in subsequent numbers—when time and opportunity have been given to readers to mention subjects on which they need advice—a portion of each weekly issue will be set apart for replies to queries under the title of

SHOP: A CORNER FOR THOSE WHO WANT TO TALK IT.

Questions, however, must be strictly confined to matters connected with trades and handicrafts. Replies will be given in every case by practical men who know what they are about, and who thoroughly understand the subject on which they undertake to write. It will not be possible, however—and readers must ever bear this in mind—to give answers immediately to questions asked. It is commonly thought that a question asked one week can be easily answered in the next week's issue. This is impracticable, as those who give the replies reside in every part of the United Kingdom, far and near, and with magazines of a large circulation, it is necessary *to go to press*, as it is termed, or, in other words, to finish them, some days in advance of the date of publication.

Readers and contributors who are possessed of reliable recipes that they themselves have tried and tested are requested to forward them to the Editor for insertion in

MEANS, MODES, AND METHODS,

a department which, in time, will constitute a most valuable collection of formulas and processes. Senders of recipes will be held responsible for their accuracy and utility, and must give names and addresses—but not necessarily for publication. In all cases when recipes are copied from contemporary publications, their source should be indicated. Recipes copied from old books will be declined, as it would be easy to fill whole pages of the magazine from such sources without any possible benefit to the readers.

At intervals, large sheets will be issued, containing full-size Working Drawings to Scale, of Art Furniture, Decorative Work, Machinery, etc., that may be made and mounted in the workshop at home, and other subjects of general and special interest. The Cabinet in Fretwork, presented with Number 1 and Part 1, will serve as an example of these sheets.

The articles and papers that appear in WORK will be supplied by capable writers of experience and marked ability, who will spare no pains to render the Magazine, not only unrivalled, but beyond all rivalry as

THE LEADING TECHNICAL INSTRUCTOR OF THE AGE.

It only remains now to indicate the field of operation that it seeks to cover. It appeals to the interests of all workmen, professional and amateur, who are to be found in the United Kingdom, the Colonies, and Dependencies of the British Crown, the United States of America, and, in short, throughout the world wherever workmen who speak and read the English language are to be found. It is a wide area, it is true, but WORK will be known all over it and throughout it before 1889 is numbered among the years that are past and gone.

THE EDITOR.

THE BUNSEN BATTERY.

How to Make, Work, and Maintain It.

BY GEORGE EDWINSON BONNEY.

I.—INTRODUCTION—CHIEF CHARACTERISTIC OF BATTERY—CLASSIFICATION—INNER OR POROUS CELL—POROUS POTS—POSITIVE ELEMENT OF BATTERY—ANOTHER ARRANGEMENT—DAMPER—AMALGAMATION OF CYLINDERS—CARBON ROD—BINDING SCREWS AND CLAMPS—WIRES.

IF I were writing for any other paper except WORK, I should feel myself bound to apologise to its readers for introducing a subject on which so much has been written in other and older magazines. The youth of WORK, however, in relation to its contemporaries, together with the fact that it will appeal largely to young workmen—more largely, I expect, than any existing publication, whether in the Old World or in the New—has led me to select a Bunsen battery for treatment in this my first article. Some of us older workmen are apt to think that because we know all that can be said or written on any given subject, everybody else must have an equally good acquaintance with it. We are apt to forget the troubles of our younger days, when we picked up our stock of knowledge bit by bit and crumb by crumb from every source within our reach. So, when we take up our weekly newspaper, we hastily scan the titles of the articles, and as quickly run our eyes down the columns in search of a novelty. If we find something new, something that adds to our stock of knowledge, we read the article carefully; but if we fail to meet with some new thing, we turn aside contemptuously and condemn it as a thing of little worth. Perhaps this estimation is a good one as regards its value to ourselves, but a little consideration will lead us to the conclusion that we are but units among many thousands, and of these there may be many only too glad to have what we despise.

We stand as lights to the younger workmen around us. The future of this nation depends upon those young men. If they learn to despise knowledge now, they will live to find themselves common labourers to the skilled workmen of other nations. Much good or harm may be wrought in the mind of a young man by the example of older men, and therefore it behoves us to be careful in our manner towards the inquiries of our young men. The best of them will not stand still because we happen to be tired with the day's work. The time has passed, and is gone never to return again, when lads were silenced by a peremptory order such as "You do as I tell you, and ask no questions." Youths *will* ask questions, and will *expect* answers, and if we do not answer them truly they rightly lose confidence in us and seek their answer elsewhere.

Therefore I take the risk of being told by my older brethren that I am writing on a stale subject, because I know that what I have to say will be acceptable to others, and I shall always be pleased to answer their questions.

The Bunsen battery receives its name from Professor Bunsen, its inventor. As generally used in England, it may be regarded as a cheaper and modified form of a battery previously invented by Mr. Grove, and now known as the Grove battery. In the Bunsen battery a plate of carbon, or a block of this substance, replaces a thin plate of platinum used in the Grove battery. This is the only difference between them. The result of this difference in cost is that between the prices of carbon and platinum, amounting generally from 4s. to 5s. per cell in favour of carbon. The result in power obtained may be put down as ·08 volt. in favour of the platinum.

The Bunsen is classed as a double fluid cell because two fluids are used to excite its action. Each cell of a battery is composed of an outer or containing cell or pot, and an inner or porous pot or diaphragm. One such composite cell may be named a battery, whilst this may be composed of any number of cells connected together. The outer containing cell in general use is a cylindrical jar of stoneware, 6½ inches by 3¾ inches, or 6 inches by 4 inches, holding (when the porous cell is left out) about one quart of liquid. This is named a quart Bunsen, and costs 9d. each cell; smaller cells holding a pint of liquid are used sometimes, and larger cells, holding respectively half a gallon and a gallon of liquid, are used for large operations such as in electroplating. When the battery is required to fit in a box or similar rectangular-shaped space, the cells are made either square or rectangular to suit. Cells are also made in glass and in porcelain, in all sizes and shapes demanded.

The inner or porous cell is made of porous earthenware, and is intended to act as a partition between the two liquids employed in charging the cell, to keep them from mixing freely together. The pores allow the two liquids to just touch each other through the pores, and thus form a conducting path for the electricity generated in the cell. These porous cells are made in a cylindrical form for round pots, or in flat, rectangular forms for the square or rectangular pots. They are made in sizes to suit the outer containing pots, the size of which should always be given when ordering porous pots. As a general rule, the rim of the porous pot should stand from ½ an inch to ¾ of an inch above the rim of the containing pot, and there should be ¾ of an inch space around the porous pot between its sides and the inner sides of the containing pot. Too much space between the two cells tends to increase the internal resistance of the battery.

Porous pots are made in two kinds of ware—one red, the other white. The red ware is sometimes glazed around the rim to keep the salts formed in one cell from creeping into the other; but this does not present any advantage, for the salts creep up under the glaze and eventually peel it off, leaving an unsightly ragged rim. The white ware is most compact and more uniform in texture, so to speak, than the red ware. Cells differ a great deal in their degrees of porosity, and should be chosen as nearly alike as possible. The appearance of hardness serves as one guide to a choice, and this may be verified by filling all the chosen cells with clean water and setting them aside on a dry bench or table. Very porous cells will allow the water to come freely through their pores, and their porosity may be determined by the quantity of water coming through the pores in a given time. If cells are too porous they allow the nitric acid to pass into the other cell, and so spoil the solution contained therein; while, on the other hand, if they are not sufficiently porous, or too hard, they increase the internal resistance of the battery, and thus reduce the force available for work.

The positive element of this battery is made of zinc. This is the wearing part of the battery; it is the fuel intended to be

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consumed to furnish electric force. As in the furnace of a steam boiler we oxidise or burn coal to supply steam force, so in a battery we oxidise zinc to generate electric force. The zinc element of a Bunsen battery is generally made of $\frac{1}{8}$ inch best rolled Belgium zinc plate, bent in the form of a cylinder when intended for use in a round cell, or in the form of flat plates when used in square or rectangular cells. When very thin porous cells of the flat form are employed, the zinc plates are sometimes bent in the form of the letter U, and thus made to surround the cell, going down one side, under the bottom, and up the other side. By this arrangement a powerful cell can be got into a small space.

Another arrangement possessing similar advantages consists in coupling two zinc plates together at their tops, and immersing their lower edges in a layer of mercury at the bottom of the outer cell. The zinc cylinder used in the round cells should be just small enough to slip easily into the cells without leaving any appreciable space between their sides and the sides of the cells, as only the inner surface is acted upon with advantage. The upper rim of the cylinders should come just $\frac{1}{2}$ an inch above the rims of the cells, for convenience in attaching the binding screws to which the connecting wires are fastened.

If we immerse clean zinc in dilute sulphuric acid (the solution employed in charging the outer cells of this battery), it will rapidly oxidise and be converted by the free acid into zinc sulphate, whilst a quantity of hydrogen gas is sent from the solution into the air. Under such conditions as these, a large part of the energy so generated would be wasted in heating the solution and ejecting hydrogen from it, and only a small part be available in the form of electricity. We have, therefore, to check this rapid combustion and put a damper on, to ensure a more slow and useful oxidation of the zinc. The damper employed is mercury, known under the common name of quicksilver. Mercury possesses the property of being able to take to itself a portion of some other metals with which it is brought into contact, and form an alloy which is named an amalgam of mercury. It readily attaches itself to clean zinc, and forms with it an amalgam of zinc and mercury. This amalgam is not so readily attacked by dilute sulphuric acid as is pure zinc, and it possesses the merit of being only dissoluble in the acid when the circuit of the battery is closed, or, in other words, when it is set to work. We therefore cause the cylinders, or the plates of zinc (to be used in this battery), to receive a coat of mercury, when they become amalgamated with it, and protected from the attacks of the acid.

Some makers send out their zinc cylinders amalgamated ready for use. If they are not thus prepared, they must be amalgamated before they are used. Our first care is to clean the zinc. If this is greasy, the cylinders should be soaked in hot alkali—soda or potash water—and then rinsed in hot water. Meanwhile get a shallow dish, such as an earthenware baking dish; pour into it enough water to cover the lower side of a cylinder when placed in it sideways; then add one-third of this quantity of commercial sulphuric acid (oil of vitriol) slowly and carefully. When this is done, pour into the dish enough mercury to cover the bottom of it, or to be easily scooped into the interior of one of the zinc cylinders. The acid solution will be scalding hot, and into this place the cylinders one at a time, rolling each cylinder over and over in the mercury, passing this through the interior and well brushing the mercury over every part, inside and out, with an old plate brush, a mop of hemp, or a hare's foot, until every part has been covered. If some fine copper wires can be placed among the hemp, or in the brush, they will facilitate the spread of the mercury. As each cylinder is amalgamated, set it to drain in a stoneware pot to catch any mercury that may come off. If parts of the cylinders are left uncovered with mercury, the acid will attack the bare parts and pit the zinc.

The negative element of the Bunsen battery is a bar or rod of carbon, of square section, or a plate of carbon to suit the porous pot in which it is to be placed. The carbon bars used in this battery are made from fine coal and coke compressed in a mould with some binding medium, such as gas tar, and heated to give it the needed hardness. A substitute may be improvised out of the scurf from the roof of a gas retort, obtainable from gasworks. This is procurable in rough misshapen lumps, which have to be sawn to the required shape before they can be used in the battery. This is done by means of an old saw, or a piece of sheet iron notched like a saw, using plenty of water as a lubricant. It is a hard and dirty job, and not worth the candle, when we consider the low price of carbon blocks (one penny per square inch), obtainable from all vendors of electrical articles. Common gas coke, or even best oven coke, is not hard or compact enough in itself to form a substitute. Well moulded and baked carbon blocks are indestructible by nitric acid, and will last an indefinite time.

Connection is made between the carbon block of one complete cell and the zinc cylinder of another by means of copper wires, or strips of sheet copper, attached temporarily to the elements by brass binding screws and clamps. The wire is secured to the zinc cylinder by means of a binding screw. The cheapest forms of these are usually very defective, and after a little use they either spring apart and crack at the shoulders, or the very fine threads of the screws wear out, and so fail to hold. When buying these, see to it that the screws are properly cut with deep threads, the females with long bearings, and the shoulders strong. The wires are secured to the carbons by a kind of binding screw named a clamp. There are some two or three patterns of these clamps in use. One has a slot only to receive a strip of copper as a connector. This is inconvenient for wire connectors. The other patterns have holes pierced in a lug, either at one side or on top and in the centre of the clamp. The last form is preferable in actual use. In buying clamps, see to it that the jaws are wide enough to clasp the ends of the carbon blocks, that the screws are long enough, and the threads well cut. The heads of the screws should be flat, not milled, as the milling cuts one's fingers when connecting or disconnecting the screws. It is also best to have all the screws and clamps lacquered before they are used, as the lacquer protects the brass from the attacks of acid fumes. If binding screws and clamps are not lacquered they should be made as hot as can be borne to the hand, then dipped in hot melted paraffin; allow all the surplus paraffin to drain off whilst still hot, then clean all points of contact with emery cloth. The holes are best cleaned with a pointed stick dipped in flour emery.

The wires for connections should be slightly larger than the line wires employed; that is to say, if we employ a line of No. 16 B.W.G. copper wire from the battery to the work, we should have connecting wires of No. 14 B.W.G. copper well annealed.

(To be continued.)

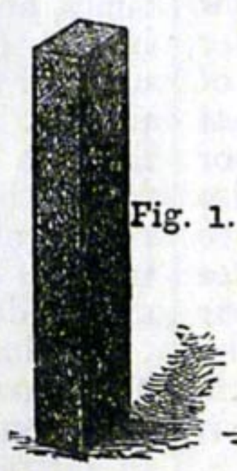

Fig. 1.

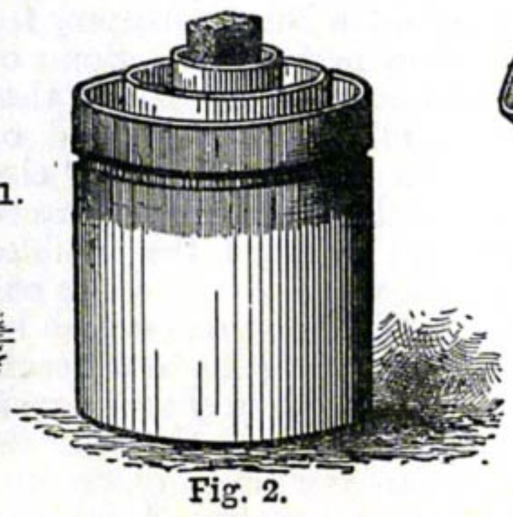

Fig. 2.

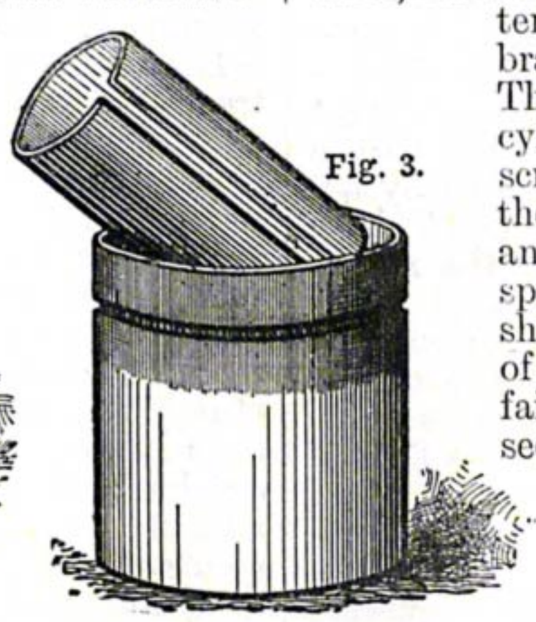

Fig. 3.

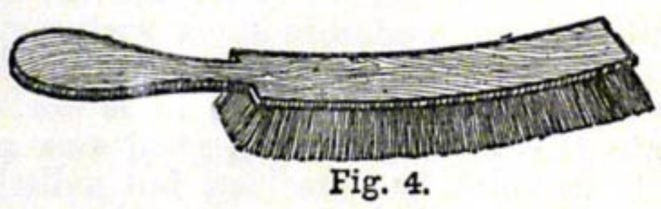

Fig. 4.

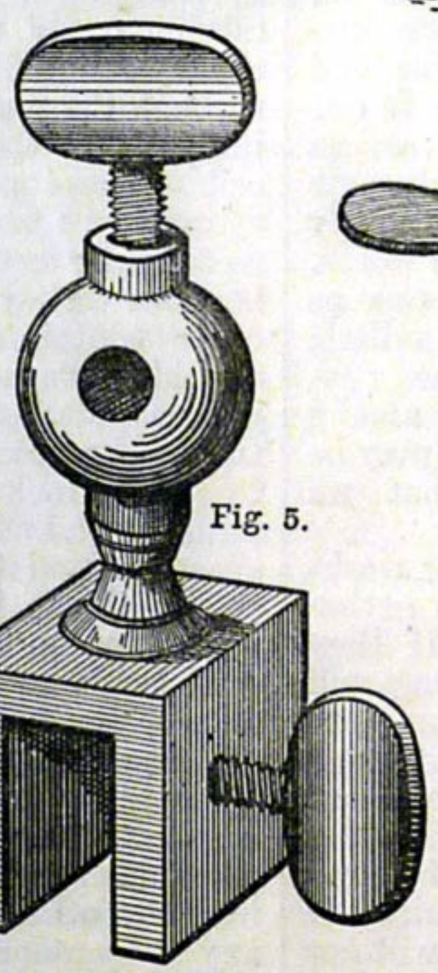

Fig. 5.

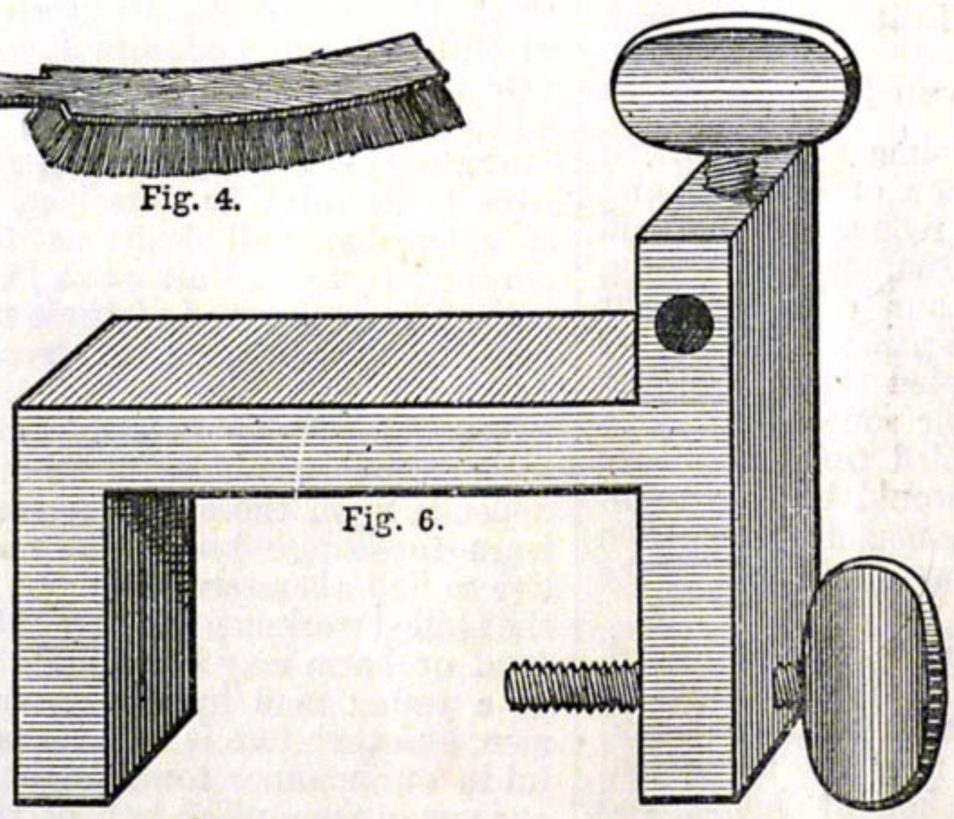

Fig. 6.

Fig. 1.—Carbon Block for Bunsen Battery. Fig. 2.—Complete Cell. Fig. 3.—How to Set Zinc Cylinder on Outer Cell to Drain after Amalgamation. Fig. 4.—Brush for Cleaning Zinc Cylinders. Fig. 5.—Binding Screw for Zinc Cylinder (full size). Fig. 6.—Ditto for Carbon Block (full size).

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A CHAT ABOUT FURNITURE.

Text—Two Fancy Tables.

BY D. ADAMSON.

THE OLD LOO TABLE—CHIPPENDALE'S DESIGNS—QUASI ART CRITICS—REQUIREMENTS IN DESIGNING FURNITURE—CURVED OUTLINES IN FURNITURE—CHANGE OF TOPS: ITS UTILITY—SUITABLE SIZES FOR SMALL TABLES—MATERIALS—TOPS—LEGS—FRAMING—BLOCKS—FIXING—ALTERNATIVE FORM OF TABLE.

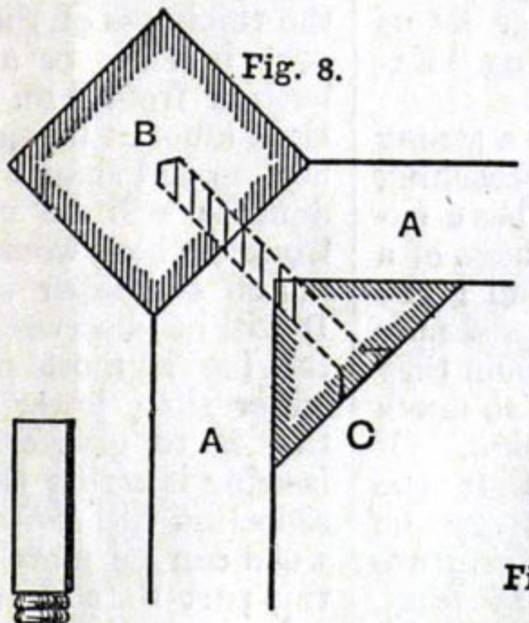
THE old-fashioned centre or loo table is seldom seen in use nowadays. The style in furniture, not only as regards the articles themselves, but in decorative details, has rapidly changed during the past twenty years—is, indeed, now changing. The place of the massive-looking loo table, with its frequent over-elaboration of carving, its ponderous claws, in all its glory of burr walnut top, a glory of marking which, as a little bit of decoration planned and executed by the Great Architect of the universe, could not be utterly ignored even amid the uncouth and inartistic work of the middle of this century, is now occupied by the small, light occasional table—or say, rather, several of them. Old-fashioned things, are they? The old style coming up again? Indeed! Yes, I have heard all that before often and often, but reiteration of a mistaken notion does not prove the truth of an assertion.

It is a popular mistake to suppose that our modern furniture designers do nothing but copy old models, and that the beautiful productions of the artistic cabinet maker are nothing more than facsimiles of—Chippendale, you suggest. Well, well, let the poor old man rest. You may safely do so without scruple, for not from him, nor yet from his contemporaries, does the modern designer draw inspiration. Occasionally a piece of Chippendale may be reproduced, but not often, and then it is generally one of his quieter and simpler designs.

In all its horrible eccentricity of nondescript Gothic, worse Chinese, and inane rococo, combined though they be with the most exquisite workmanship and occasionally a quaint gracefulness, Chippendale's style is not in favour with those whose training enables them to discriminate between the true and the false in design.

In designing furniture—and I daresay anything else—one must first have some acquaintance with mechanical work. Without this it is impossible to decide how the very unmistakable reality. Is, then, the fashion in furniture not influenced by the designer or the manufacturer? To a great extent it is, but he does little more than apply his skill in such a direction as may, in his opinion, best supply the demand. For the rest the designer must rely on his own resources and his general ideas of what constitutes a beautiful object. At the present time fashion seems to require that everything must be cheap as well as pretty, the latter being an unknown quantity.

Fig. 1.—Table with Curved Legs.



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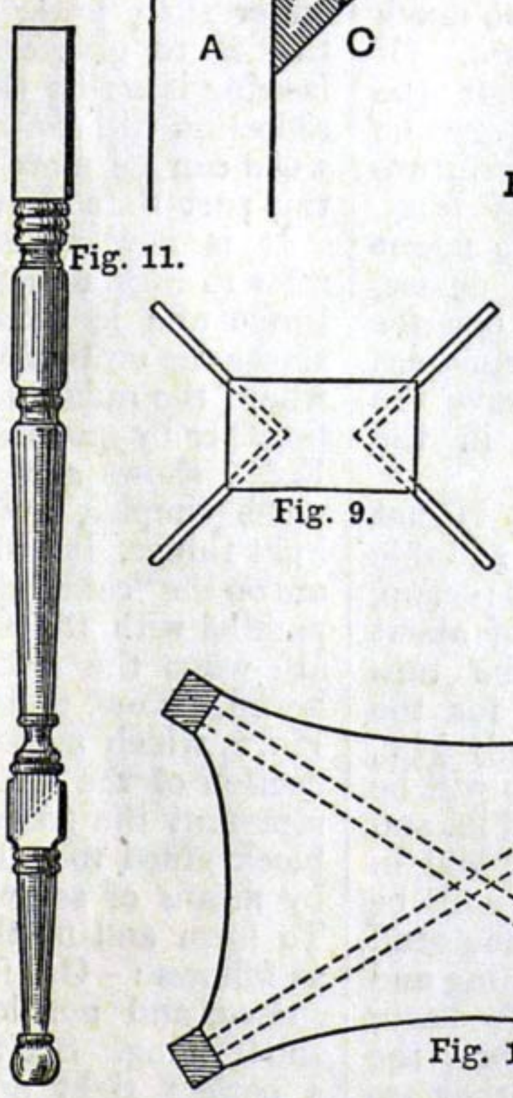
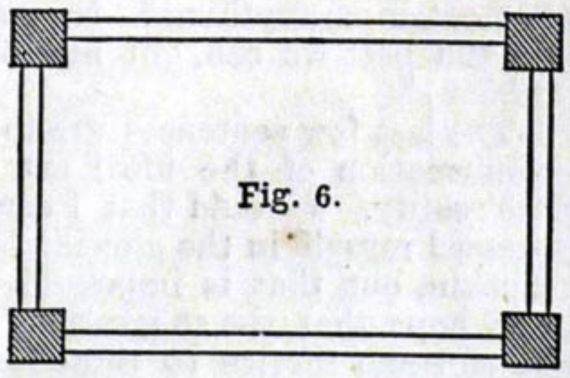


Fig. 11.

Fig. 9.



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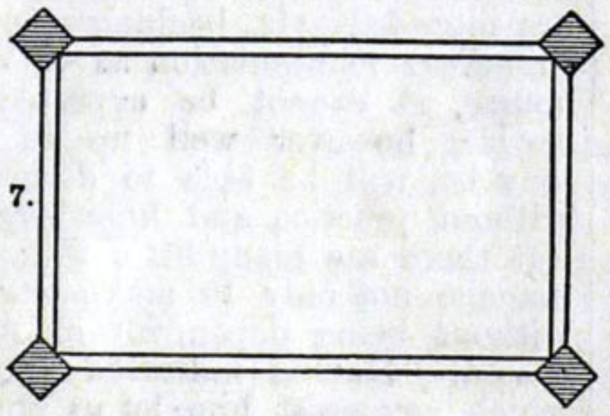


Fig. 7.

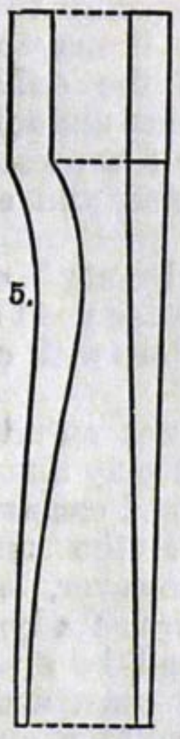


Fig. 5.

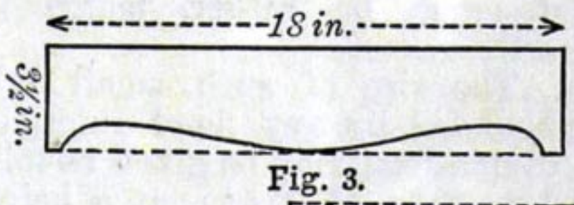
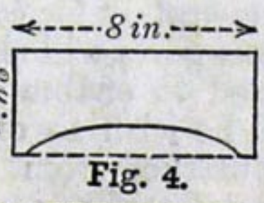


Fig. 3.



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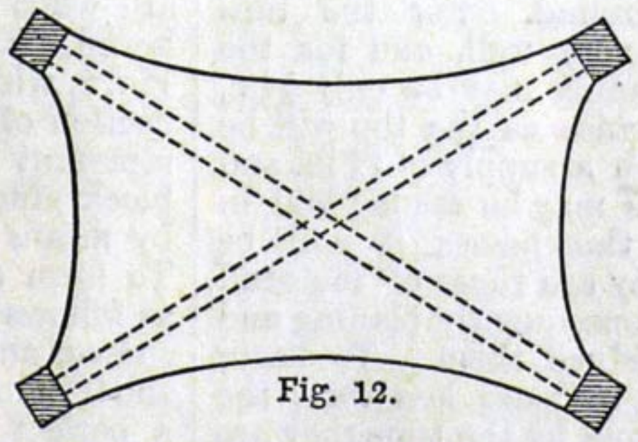

Fig. 12.

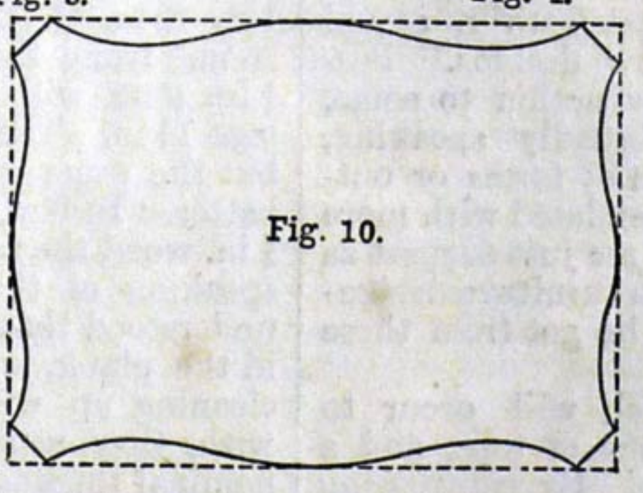

Fig. 10.

Fig. 3.—Long Rail of Framing. Fig. 4.—Short Ditto. Fig. 5.—Leg. Fig. 6.—Ordinary Framing. Fig. 7.—Alternative Ditto. Fig. 8.—Connection of Rails and Leg. Fig. 9.—Stretcher Board and Rails. Fig. 10.—Shaped Top. Fig. 11.—Turned Leg. Fig. 12.—Bottom Board and Stretcher for Fig. 2.

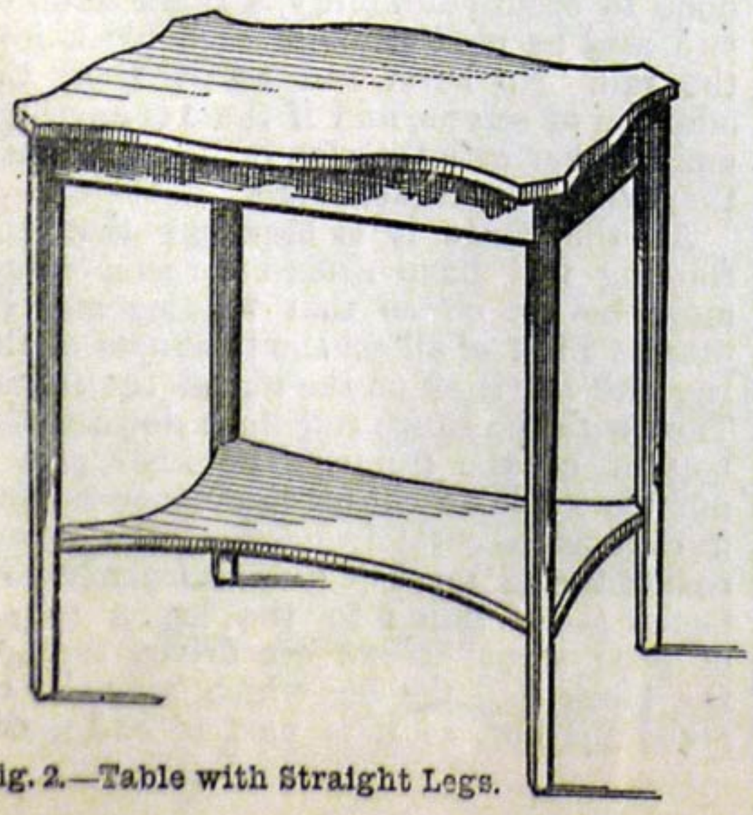

Fig. 2.—Table with Straight Legs.

material—in this case principally wood—can be used to the best advantage, without cumbersomeness on the one hand or fragility on the other. After this, convenience must be studied. Is the design suitable for its intended purpose? To take an extreme case for the sake of illustration, in designing a chair for ordinary use, would any one raise the seat three or four feet from the ground? To do so, of course, would be absurd, for such a height would, except for special purposes, not be pleasant. One could not sit at an ordinary table in such a chair nor put it to the intended use of a chair. Fashion, further, has much to do with design, for it must not be forgotten that those who cater for the public must do so according to popular demand. If one asks who creates fashion, what can the answer be? It is a species of evolution, but in its origin is so intangible that it cannot be grasped. It is like the fog—very undefined, but with a

My ideas may be that the two little tables illustrated are pretty; the reader's may be that they are the reverse. I hope not; but they are certainly inexpensive, which means that there is neither a superfluity of wood nor that the construction is complicated. For this reason, if for no other, they will commend themselves to the inexperienced maker, and if he is influenced by a desire to have fashionably designed furniture, let it be said that they, or others of similar character, may be seen by the dozen in our leading furniture shops.

Those who observe these will notice that a reaction seems to have set in against the severe, straight lines of the so-called Early English style, and that curves are introduced where a few years ago it would have been considered heresy to do so. These curves are generally supposed to distinguish the Queen Anne style, so those who wish may call these tables so. The fact is that curves, more or less graceful, are not confined to any particular style, and it is by recognising and applying whatever is beautiful in form and colour that the art renaissance of the present age is nourished.

Another thing which must be regarded in designing furniture, or, if you will, in adapting old designs to modern tastes, is this:

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as habits change, so does our furniture. In its way, the massive Elizabethan table with its bulbous legs is good—may have been best adapted to the period when it was supreme. Now, in our ordinary living-rooms it is out of harmony with the surroundings. We do not require such ponderous structures, in our drawing-rooms at any rate. Lighter things are more convenient, and if they are not so strong they are strong enough. We do not expect a small table to be knocked about in a reckless manner, nor yet that any great weight should be laid on it; hence, whatever some may say about the necessity for everything being made as strong as possible, let us qualify their dicta by saying as strong as service and utility demand. Now, for fancy drawing-room tables these are substantial enough, fragile though they may look and wrong in theory though the curved legs of one of them may be according to some people. For their comfort it may be admitted that were strength the only consideration, these curved legs are undoubtedly not the best form; but for the present let us adopt the Hogarthian idea and eschew straight lines.

Whether the "line of beauty" or the "Eastlake" style be the better need not be discussed. We want two tables with curves, and we will have them.

As a rule, curved outlines entail more work than straight, and it may almost be said that some forms of shaped construction are beyond the range of the amateur worker. These tables, however, are so simple that no one who can use a bow saw or a good fret machine need be afraid to tackle them. The general construction of both being the same, it will be unnecessary to give instructions separately for each. The drawings of the various parts will show sufficiently what is required to enable any one to make either, or, if he wish to exercise his ingenuity, to construct from the elements given tables which to a casual observer might seem new designs. Possibly this may be a new notion to some, and as all design is, broadly speaking, merely a new combination of forms or outlines already known and rendered with more or less ease and grace, let me just suggest as a very elementary lesson in furniture designing a few ideas that may be got from these tables.

Perhaps the first which will occur to most is merely the change of tops, and a very practicable one too. By transposing the tops we get already four different tables. Then there are the bottom boards; they may be changed in the same manner, The shaped rails may be substituted for the straight framing, or *vice versâ*. The tops, instead of being oblong, may be square. Alterations in outline will also occur to the student, and by-and-by he will find himself able to prepare his own designs instead of being, as is too frequently the case with amateur cabinet makers, compelled to merely copy a piece of furniture, whether in existence or only a drawing. When he is to some extent able to work alone, more pleasure, not to say utility, will be gained. There is a desire to see the ideas set forth in pencil embodied in solid form. The drawing but feebly represents the finished thing, in which the interest grows as the work proceeds. We have the ideal completed article in our mind's eye, and we are naturally wishful to see whether the actual approaches it. It never does; at least, I, for one, am always disappointed in some detail or other, and I imagine that is the experience of most of us, whatever our work may be.

But why should this be mentioned? Not needlessly, I hope, for it may save the novice, at any rate, some vexation to be aware beforehand that success is only comparative. If his work surpasses his ideal, possibly his work may be superlative, but—and a very big "but" it is—the chances are that the ideal has been a very poor one.

Is it an exception to find that as a man progresses in any art, so to himself does his ideal seem more and more difficult of attainment? Perhaps he gets more critical as increasing knowledge shows hitherto unsuspected weaknesses—just little, tiny, insignificant details which might be improved on. Ay, the ideal in furniture work is not more easily reached than it is in actual life; but shall we on that account sit down and not attempt anything? No; rather let us do the best we can, our motto being "Excelsior!"

The last few sentences are to me a strong confirmation of the ideal not approaching the reality. I would that I could have expressed myself in the glowing language of a Ruskin, but that is impossible; and I can but hope that the suggestions offered may be of some service to those for whom they are intended—viz., beginners—not so much in actual manipulation as in design. Of course, it cannot be expected that the novice, however well up in theory he may be, will be able to design furniture without practice and knowledge of facts, but there are many little things he might manage not only to make but to devise, without being dependent on any one for design. Having indicated the principles which may assist him, let us now leave the designer, or, rather, merge him in the artisan.

The size of such small tables is not bounded by any fixed rules, but suitable dimensions may be given as follows:—Top, 1 ft. 10 in. × 1 ft. 4 in., at a height of about 26 in. from the ground. For the tops $\frac{3}{4}$ in. stuff will do very well, and for the legs $1\frac{1}{4}$ in. The framing may be only $\frac{1}{2}$ in., but the same substance as the top will be better. In fact, with a supply of $1\frac{1}{4}$ in. and $\frac{3}{4}$ in. wood the tables may be made; and in speaking of these thicknesses it will be understood that they are those of the stuff in the plank, and consequently planing and cleaning up will reduce them. To begin with, they usually measure less than the nominal thickness, and by the time they are finished they will probably be little if any more than 1 in. and $\frac{1}{2}$ in. respectively. Those who prefer to use thicker stuff may of course do so, but with good sound timber the substance named is all that is necessary. In any wood the thickness for the top will be sufficient, but with a soft, weak wood—such as sequoia—it stands to reason that the curved legs may advantageously be thicker than if they are made of a strong, tough wood like ash. Ordinary baywood, walnut, pine, etc., will do if of the thickness stated.

The tops will have to be jointed, *i.e.*, the necessary width will have to be got by joining two pieces of board. Glue alone will be sufficient to join them, the edges in contact being planed as true as possible, and well worked together. The jointing should be done while the boards are in the rough, and before anything else is done full-sized drawings of the various parts should be made. For the shaped pieces, in order to ensure uniformity of outline, it will be better to form templates or moulds of thin cardboard or wood cut to shape. These can then be used as rules to set out the actual work by.

For the shaped leg table, besides the top, which is straight, and may be simply cut to size (22 in. × 16 in.), four pieces will be required for the framing. Two of them will be of the size and shape indicated by Fig. 3, and the others by Fig. 4. The legs must also be got out, as shown in Fig. 5, where it will be more clearly seen than in the illustration, Fig. 1, that they taper to the lower end, and that they are rectangular in section. They may be of the same thickness throughout, but they will not look so well, and the tapering, so far as the thickness is concerned, can easily be managed with the plane. The taper in width will of course be provided for when cutting the legs from the plank. We may suppose that the thickness of the leg at the top straight part is 1 in., or a little over, and at the bottom from $\frac{5}{8}$ in. to $\frac{3}{4}$ in. To ensure the right amount being taken off each side, the bottom end should be marked, and if this is done it will be unnecessary to take the trouble which would be involved by marking off the taper on the face of the wood. It will be observed that where the curve in the leg is most pronounced the wood is wider than lower down. The reason for this is to give extra strength where the bearing is across the grain, for a moment's reflection will show the veriest tyro that the wood can be more easily split or broken at this part than elsewhere.

It is now necessary for the reader to refer to Figs. 6 and 7, showing the plan of frame and legs fastened together. Fig. 6 shows the ordinary construction of framing, where the rails and legs are either fastened together by mortise and tenon or by dowels. Fig. 7 shows a construction which is very much simpler, and equally serviceable for light things. It will be observed that the legs are on the "cant," as it is often called, *i.e.*, not parallel with the framing as they generally are when the ordinary construction is followed. Now, understanding this, refer to Fig. 8, which shows, still in plan, the connection of the framing and the legs. A, A, represent the framing, B, the leg, and C, a block glued to A, A, which it connects, and by means of screws is fastened to the leg. To form and fit these connections proceed as follows:—Get four blocks of the section shown, and not longer than the width of the framing. See that two of the sides form a perfect right angle, easily ascertainable with the square, for if they do not it stands to reason that the framing will be "out." Fasten them into the corners of the framing with glue, and if there should be any doubt about the gluing being sufficiently well done to ensure durability, a small screw or two may be used through each block into the rail. No harm can result from the addition of screws, and if there is anything amiss either with the glue or its application they will prevent a collapse.

At this stage it is apparent that the framing will have square corners, which must be cut off so that the leg may be fitted. First of all get the thickness of the leg, and set it off on the top of the frame. Then with the gauge run lines down to the bottom of the frame. The lines give a reliable guide to cut off the corner to, and if they are accurately followed the square part of the leg must fit perpendicularly. To fasten the framing to the leg a couple of good stout screws are driven through the block into the leg, which may also be glued up, but, as it is next to end grain,

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too much reliance must not be placed on glue alone.

The top is fixed to the framing by blocks like those in the corners, glued both to the top and to the rails. Two or three blocks of, say, 3 in. long along each side, and one or two at each end, will be sufficient. They are of course fixed within the framing, not outside it under the overhang of the top, where they would show and be unsightly. In addition to the blocks, it will also be advisable to use screws, say one through each rail into the top. They should be driven in on the slant, and care be taken that they do not come through to the surface of the top.

The stretcher and bottom board shown in the illustration are not absolutely essential, but as they give rigidity it will be as well not to grudge the extra time required for them. For convenience of description they have been left till now, but in actual work it will of course be seen that they should be prepared before the table has progressed so far as described. The board, or shelf, may be taken as measuring about 13 in. × 8 in., but the size is really of no consequence; whatever it is, the construction will be the same. Four pieces, say, ¾ in. square, support it. The outer ends of these are to be cut to fit the legs, and the others screwed to the shelf from below, taking care that its corners are evenly placed above each rail. It will perhaps simplify matters for the beginner if these are fixed at right angles to each other, *i.e.*, the pair at each end of the table, as in the diagram Fig. 9. Were the legs stouter it would be better to sink the ends of the stretchers in them; and this might be done even as they are, but not to any great extent—not more than just sufficient to let the ends in, say, $\frac{1}{16}$ in. or so. In either case a screw ring or eye should be driven into each leg. The stretchers will rest on the eye, and a screw driven through it will hold firm enough.

Now for the other table, which is made in a precisely similar manner, the differences being that the top is shaped as shown in Fig. 10. The framing is straight (3 in. wide), the legs either straight tapered, or, as they may be, turned, and the bottom board larger, extending from leg to leg. As a suggestion for the turner, Fig. 11 is given. The square block allows plenty of substance for the shelf to be well sunk in it. The cut may be most easily made by sawing across and removing the surplus wood with a chisel, and the stretcher rails may be dispensed with altogether. It will, however, be better to have them, and in this case one can be carried right across to the opposite leg, the other being cut in the middle, as in Fig. 13. They will be screwed both to the shelf and the legs, as in the other table.

The maker's work is now brought to an end, and it only remains to finish the table by polishing, or, what is now very fashionable, painting them with one or other of the enamel preparations. Nothing need, however, be said at present about either of these processes, as our chat about furniture seems already to be rather lengthy, though I sincerely trust not unprofitable to any one. It has been my aim first to describe the form and construction of a good type of small table that will be found useful in any house in many places for a variety of purposes; and, secondly, by the designs that have been given by way of illustration, to enable any carpenter, whether professional or amateur, to make such tables either for his own use or for sale.

CIRCULAR-SAW RIGS FOR THE LATHE.

BY A FOREMAN PATTERN MAKER.

CIRCULAR SAW A DESIRABLE ADJUNCT TO LATHE—SAW SPINDLES IN BRASS, WOOD, AND STEEL—IRON TABLE TO FIT HEADSTOCK—ROUGH-AND-READY WOOD ATTACHMENT—ALTERNATIVE WOOD ATTACHMENT—FENCES—CUTTING BEVELS, ETC.—BEVEL SAWING—CUTTING REBATES, TENONS, GROOVES, ETC.—CANTING FENCE FOR LONG BEVEL SAWING.

THOSE who possess a lathe of not less than four-inch or five-inch centres might often save a good deal of the time spent in light sawing by attaching a circular saw thereto. A good deal of power is required to drive it, hence no heavy work of this kind can be done in a lathe. I should place the limit to the thickness which can be freely cut at from five-eighths of an inch to three-quarters of an inch. But workmen, and especially amateurs, often want to saw large quantities of *thin* stuff into strips alike, or nearly alike; and it is in such work as this that the saving is effected by the use of such a saw. When making small drawers, cabinets, boxes, etc., it is simply invaluable. There are several different ways of making the attachment, none of them very difficult, and the cost but slight. I propose, therefore, to show sundry ways in which it can be effected.

The saw itself is mounted on a spindle, shown in Fig. 1. If the headstock mandrel of the lathe has a good thread on the nose, and the spindle is screwed to make a good fit therewith, no other support will be necessary. But should the fit be imperfect, then the poppet centre must be run up, and centred in the free end to steady it while cutting. The spindle is preferably made of brass, cast from a pattern. After being screwed to the mandrel nose, it should be turned up in its place, care being particularly taken to have both the pin, and the shoulder against which the saw abuts, perfectly true. The dimensions are taken from a spindle of my own. I have found the friction of the washer, when pinched up by the nut, quite sufficient to keep the saw from slipping on its mandrel. But probably if a saw larger than five inches or six inches were used it might be necessary to make a projection, or steady pin, on the spindle to fit a corresponding notch in the saw, as is the practice with circulars of ordinary dimensions. But probably, in such a case, the interposition of a leather washer between the metal washer and saw plate would effectually prevent slipping under the heaviest cutting which could be done in a lathe.

Spindles of this kind can be made in hard wood, and will answer nearly, or quite, as well as metal ones. Fig. 2 gives an illustration of one of this character. A block of straight-grained hard wood, A, turned parallel, bonded with ferrules, and tapped like a wooden chuck to fit the mandrel nose, has a hole bored right through its body to take a half-inch bolt, B, whose square head is sunk in at C to prevent it from turning, a nut and washer at D tightening the saw in place.

Again, instead of designing the spindle to embrace the mandrel nose, it can be made, as in Fig. 3, of a piece of steel, being countersunk at both ends for the point centres of the lathe, and driven through a carrier. Or the left-hand end could be driven from a jaw chuck, or drill chuck; or, if filed square, could be driven from a square hole chuck.

We have the choice of various tables. I will describe three. Fig. 4 represents one which I made for my own lathe, and which is a good and convenient type for headstocks having parallel edges on the front portion. It is made to fit the headstock by means of the grooves, A, A, sliding down the edges of the front upright. Two quarter-inch holes are drilled and tapped in the sides of the uprights, corresponding in position with the holes, B, in Fig. 4, and a couple of thumb screws passing through these hold the table at the correct height in relation to the saw, whose spindle passes close underneath the table without actually touching it.

The table is made of cast iron, for which a pattern is required. It is very light, only three-sixteenths of an inch thick in the plate, and stiffened with a flange running all round the bottom edge. At C is shown a small fence, also of cast iron, which is provided with a slot and bolt, so that it is traversed across the table. The strip seen at its front edge, by sliding along the front edge of the table, preserves the parallelism of the fence with the saw.

The top of the table may either be planed or simply filed, the latter answering sufficiently well. The slit for the saw should properly be cut, owing to the difficulty of casting it so narrow. A key-hole saw will, if sharpened with short triangular teeth of equilateral form, like those of a hack saw, cut through soft cast iron without much difficulty. A common hack saw will, of course, do the same, but it is not thick enough in the blade to cut a slot which would take the circular saw, since the latter must have a little clearance in order to avoid noise, and grinding of the teeth, when running. To start the cut, it is necessary to drill a couple of holes at the ends where the slit is to terminate, then remove the narrow separating film of metal with the point of a thin file and so gain an entry for the narrow end of the saw, which, once entered, will cut the slit with comparative ease. It will probably be a little irregular, and perhaps not quite wide enough. If so, widen and smooth the cut sides with a thin warding file. The holes drilled to start the cut answer the very useful purpose of giving clearance around the saw teeth, preventing risk of injurious rubbing of the same.

I have given the sizes of my own table, but these are not necessarily hard and fast dimensions. The measurement between the cheeks, A, A, is omitted, since this must be accommodated to individual lathes. In a large number of lathes, in which the front upright of the headstock is not parallel but curved in outline, the fitting and making of a table of this kind would be troublesome, hence I should in such cases adopt one of the forms to follow.

Fig. 5 shows a rough-and-ready table attachment, which, though handy for occasional use, is not so substantial as the other forms figured. It may be of wood, in which case a plate of metal must be let into the shank, to take the pinch of the set screw in the socket of the T rest. But preferably it should be of metal, in which case the plate and shank could be cast in one from a pattern, though a better method would be to get a piece of sheet iron or brass, about one-eighth of an inch thick, and screw it down on the top of a bit of iron bar, forming the shank. Fig. 6 shows an enlarged view of the union. A bit of solder may be run round the angle as shown, to stiffen the joint. Whether made in wood or metal, fences of some of the forms shown in the various figures can be fitted on the table with little trouble. Even where the most substantial tables are already fitted to a lathe, it is worth one's while to have one

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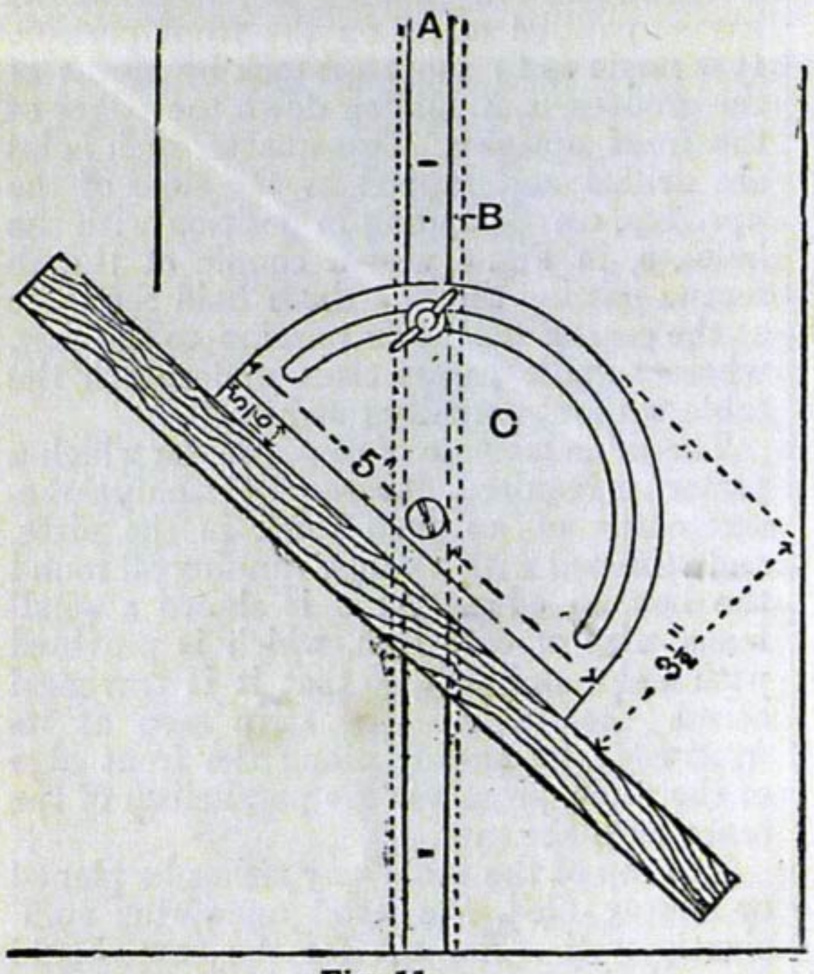

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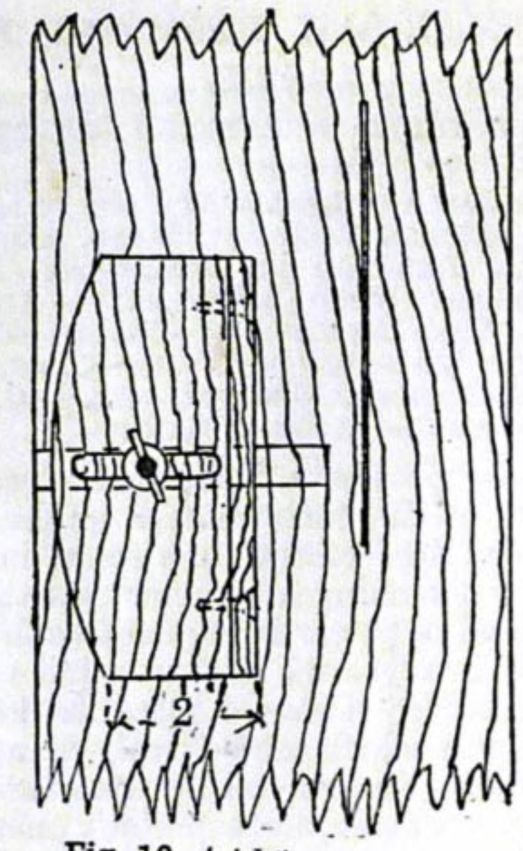

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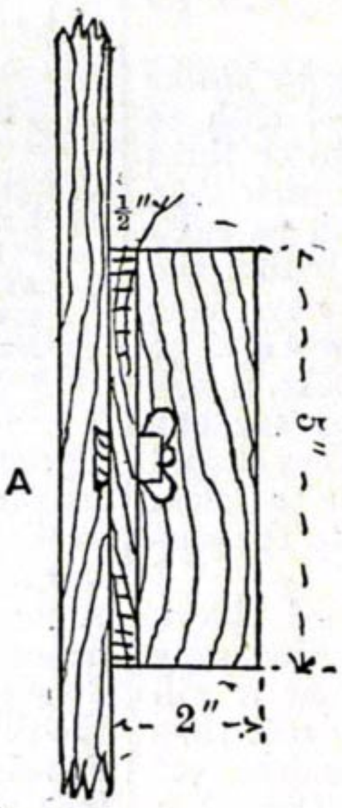

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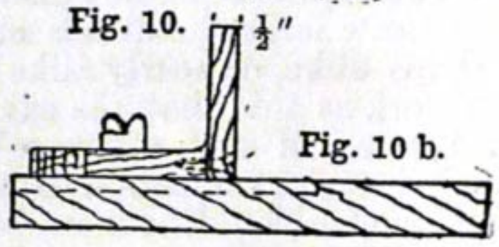

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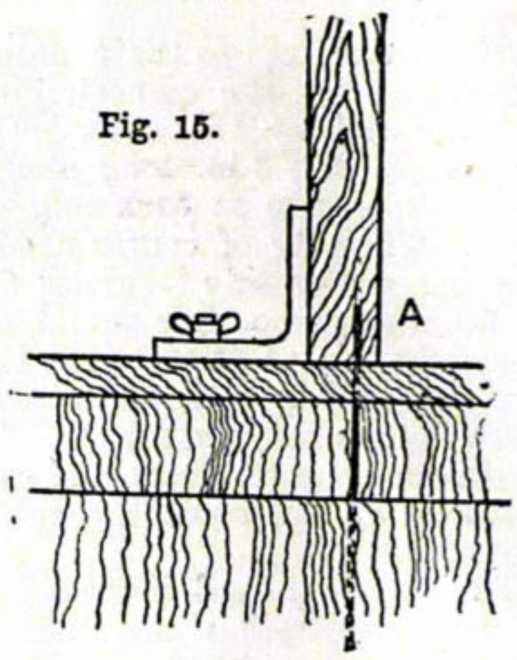

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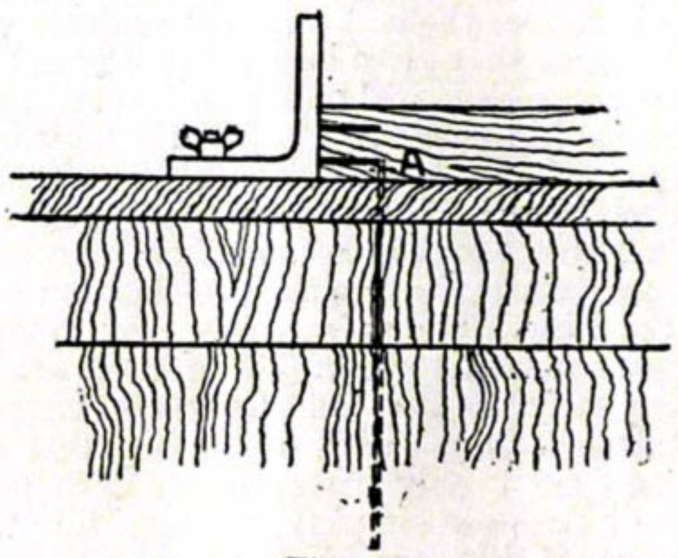

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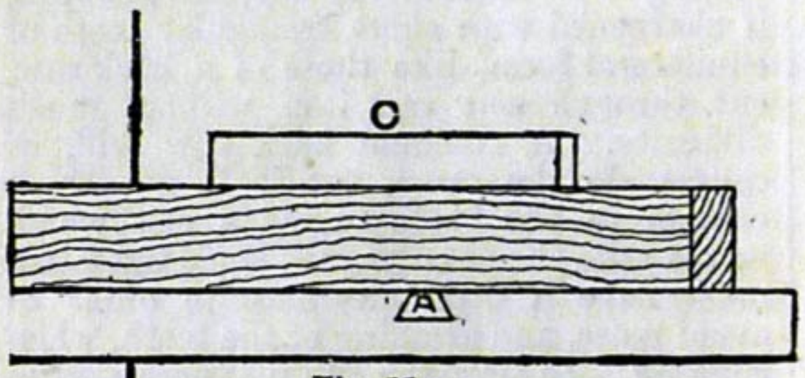

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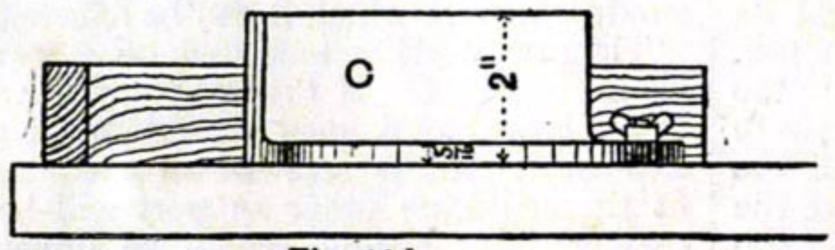

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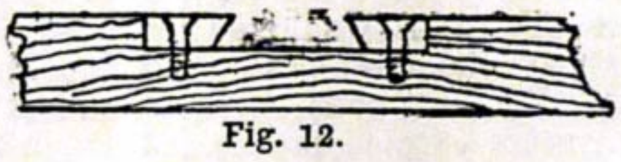
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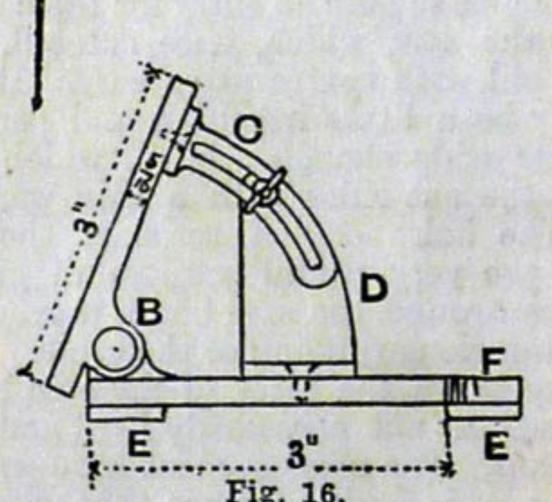

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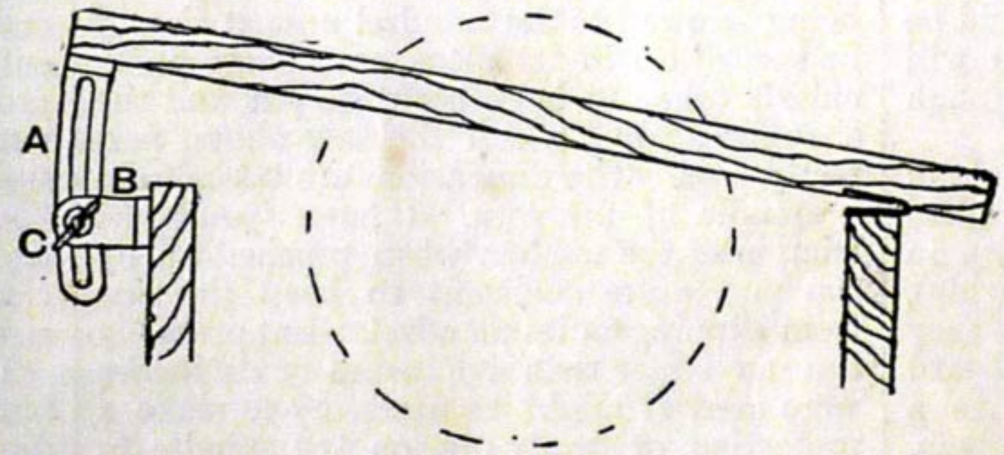

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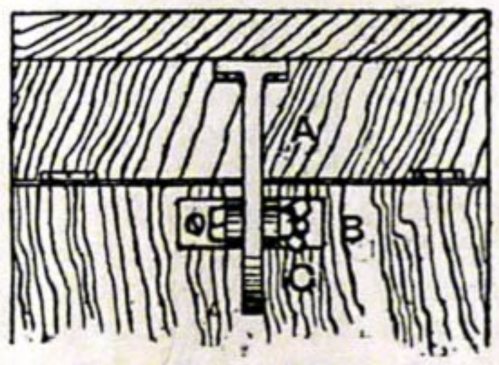

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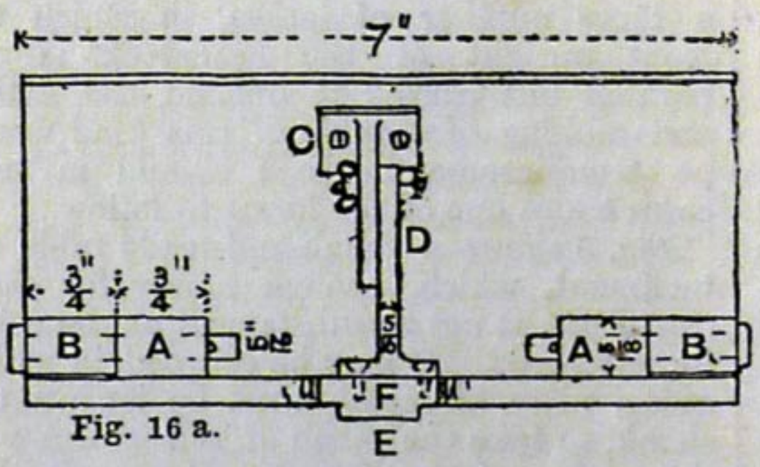

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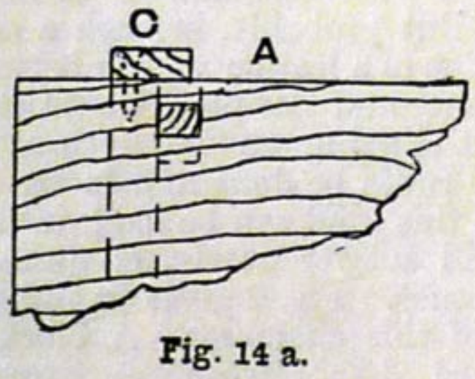

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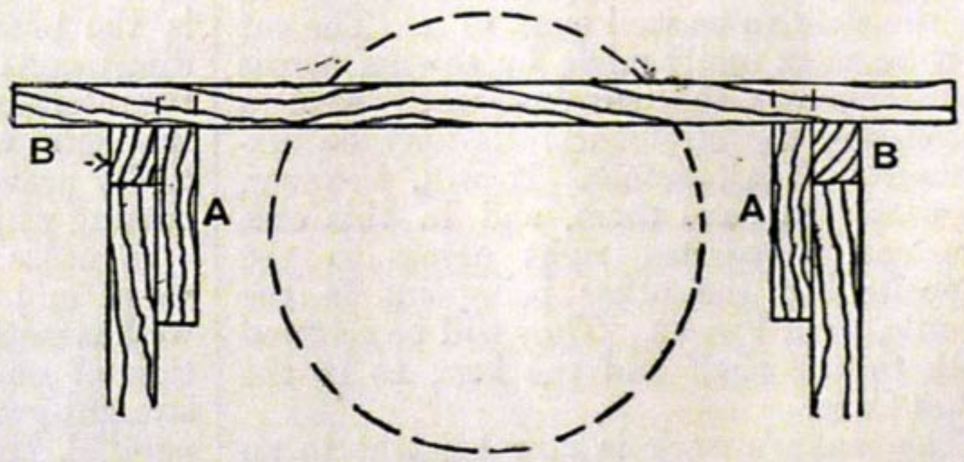

Fig. 14.

Circular-Saw Rigs for the Lathe. Fig. 10.—Plain Wooden Fence in Plan. Fig. 10 a.—Side View of Ditto. Fig. 10 b.—End View of Ditto. Fig. 11.—Fence for Bevel Sawing in Plan. Fig. 11 a.—Ditto: Front View. Fig. 11 b.—Ditto: Hind View. Fig. 12.—V Groove for Table. Fig. 13.—Hinged Table: Front View. Fig. 13 a.—Ditto: End View. Fig. 14.—Method of Elevating Table without Hinges: Side View. Fig. 14 a.—Ditto: Plan of One Corner. Fig. 15.—Sawing Rebates. Fig. 15 a.—Sawing Tenons. Fig. 16.—Canting Fence for Long Bevel Sawing in Plan. Fig. 16 a.—Ditto: Side View.

like Fig. 5 for quick attachment and temporary use. Its slit is at once readily adjusted to the saw, and the T rest is then clamped to the bed in the position corresponding therewith.

Fig. 7 shows a very good and old-fashioned rig for a circular saw, and one which almost anybody who may not perhaps care to tackle iron work can construct with little difficulty, most of the work being in wood. A is a frame of hard or of soft wood, having a tongued piece, B, screwed to its under face to fit between the lathe bearers. C is the actual table hinged to the back of A, the throwing back of the table being necessary in order to bring the frame underneath the saw. Being thrown back, and the frame slid underneath, the table is then brought down over the saw, the latter passing up through its slit—the slit having been cut by the saw itself at the time of making the table. The tongue always fitting closely between the bearers, there can be no trouble due to want of adjustment. In this case no dimensions are given, but the diagram affords an idea of relative and suitable proportions, the sizes being properly adapted to a five-inch lathe.

The full advantage of these tables is to be obtained only by the addition of various fences for the guidance of stuff which is being sawn. Some of these attachments I will now describe. Fig. 8 shows a plain guide for parallel sawing, adapted to a

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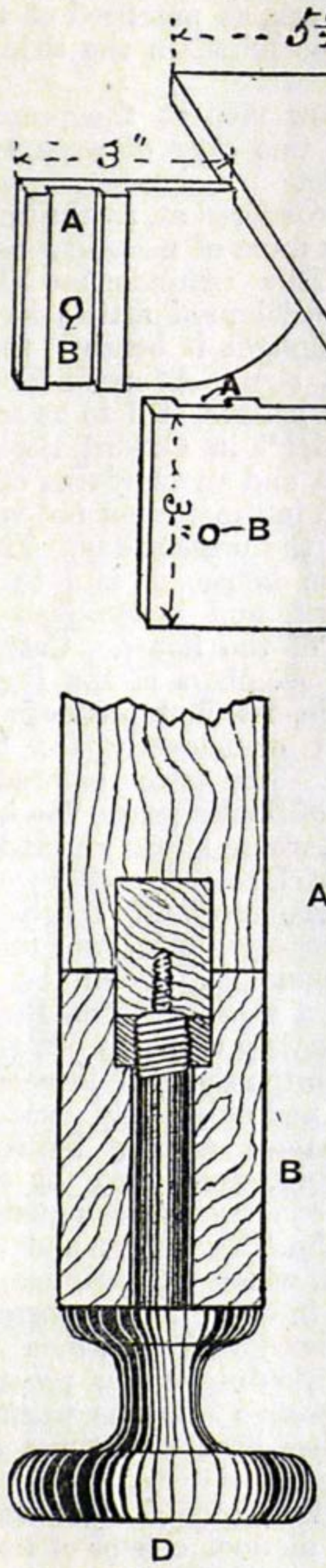

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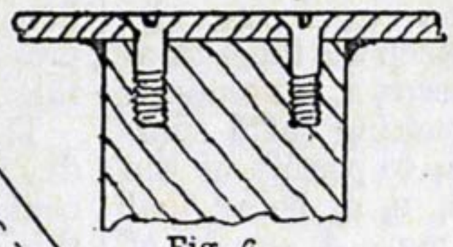

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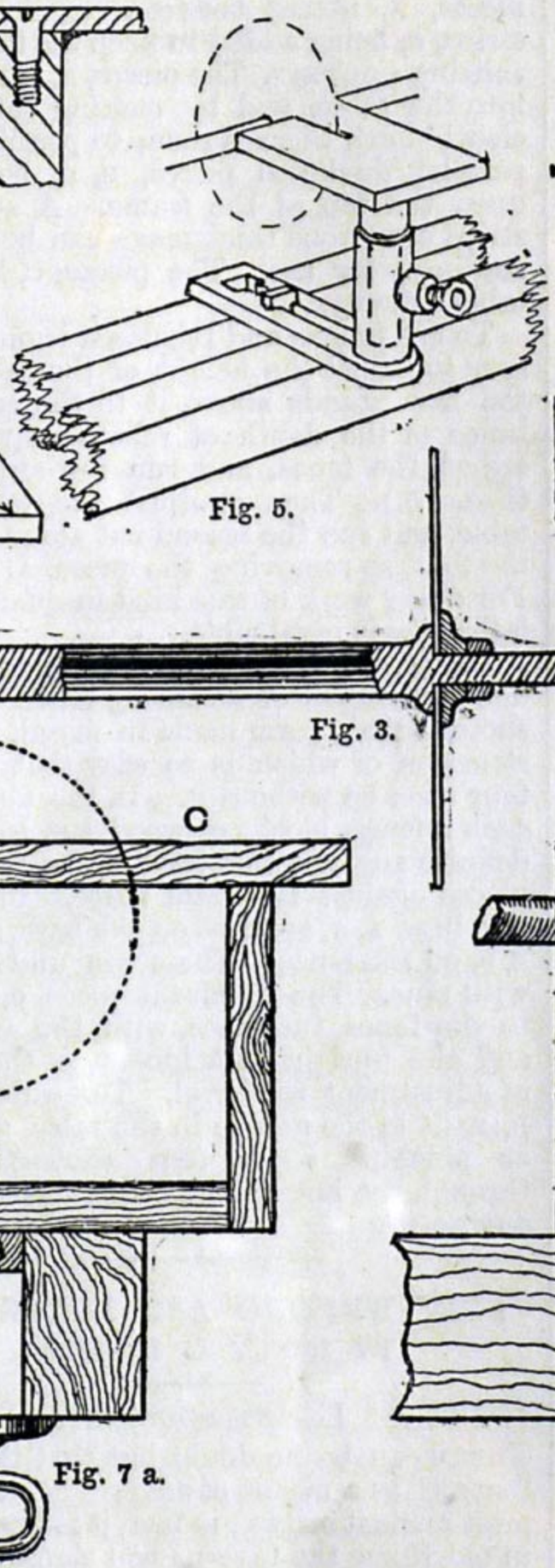

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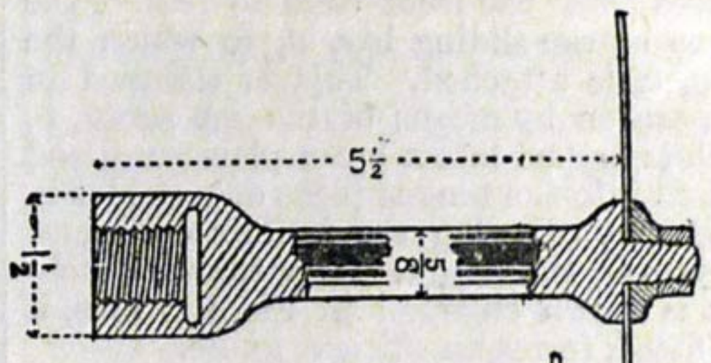

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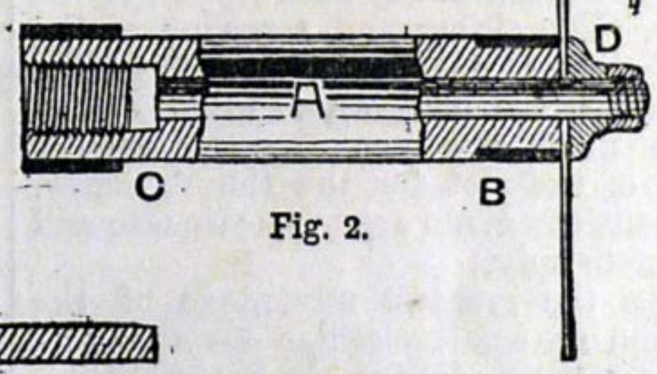

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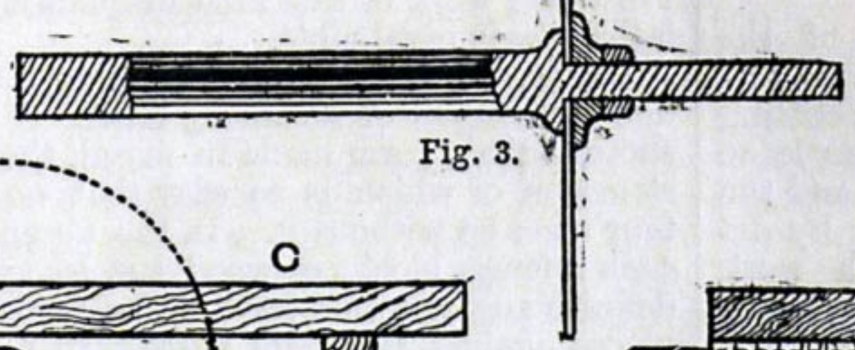
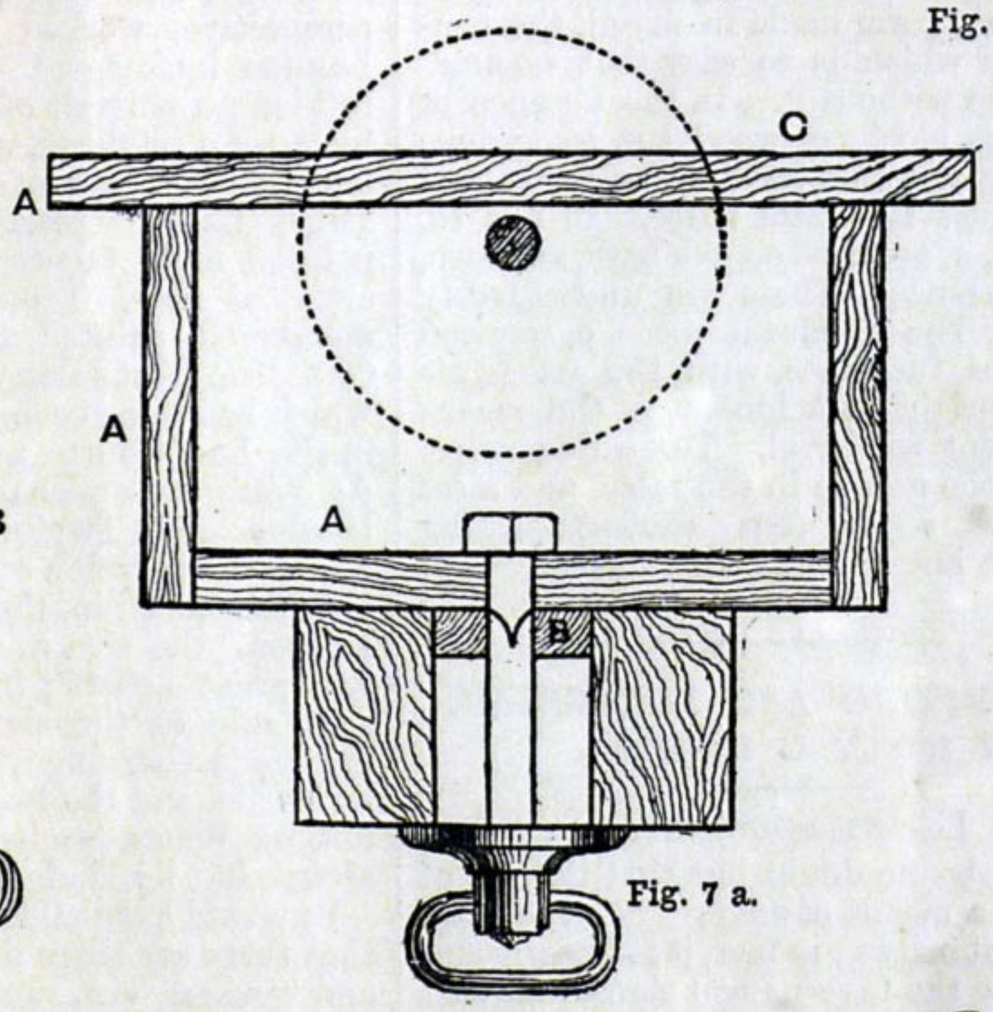


Fig. 3.

Fig. 9 a.



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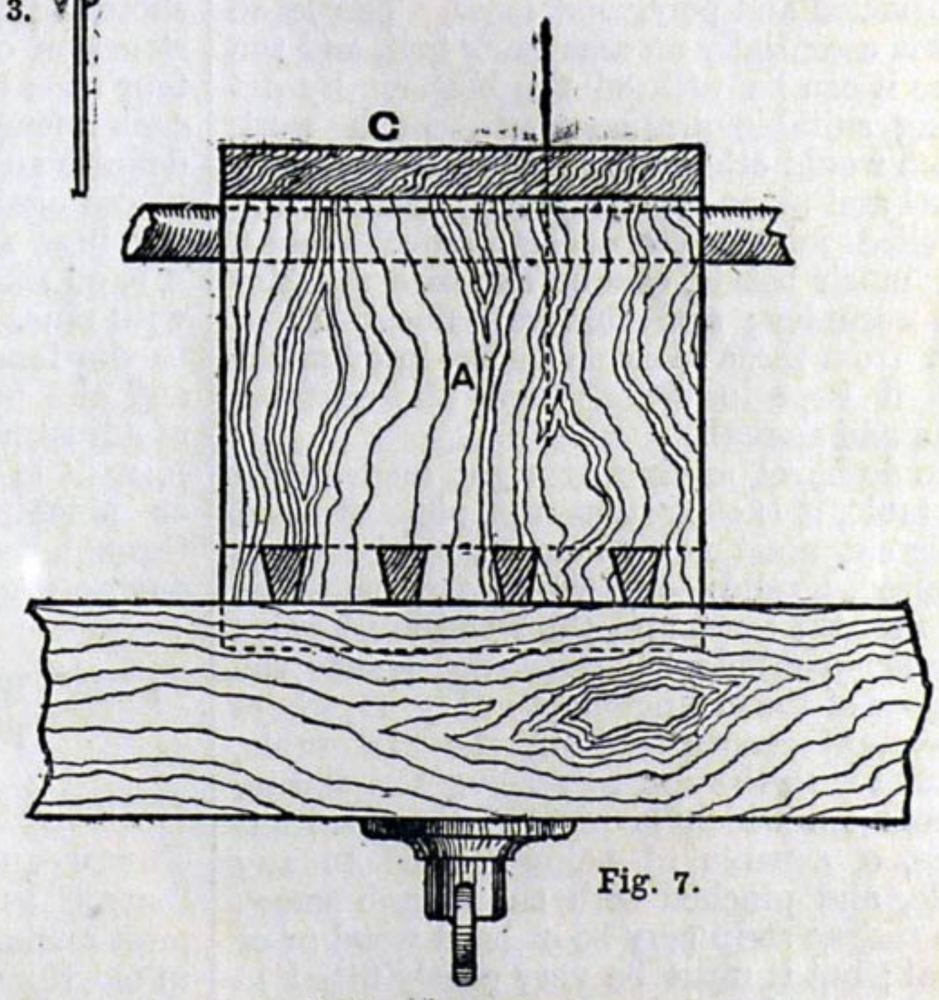

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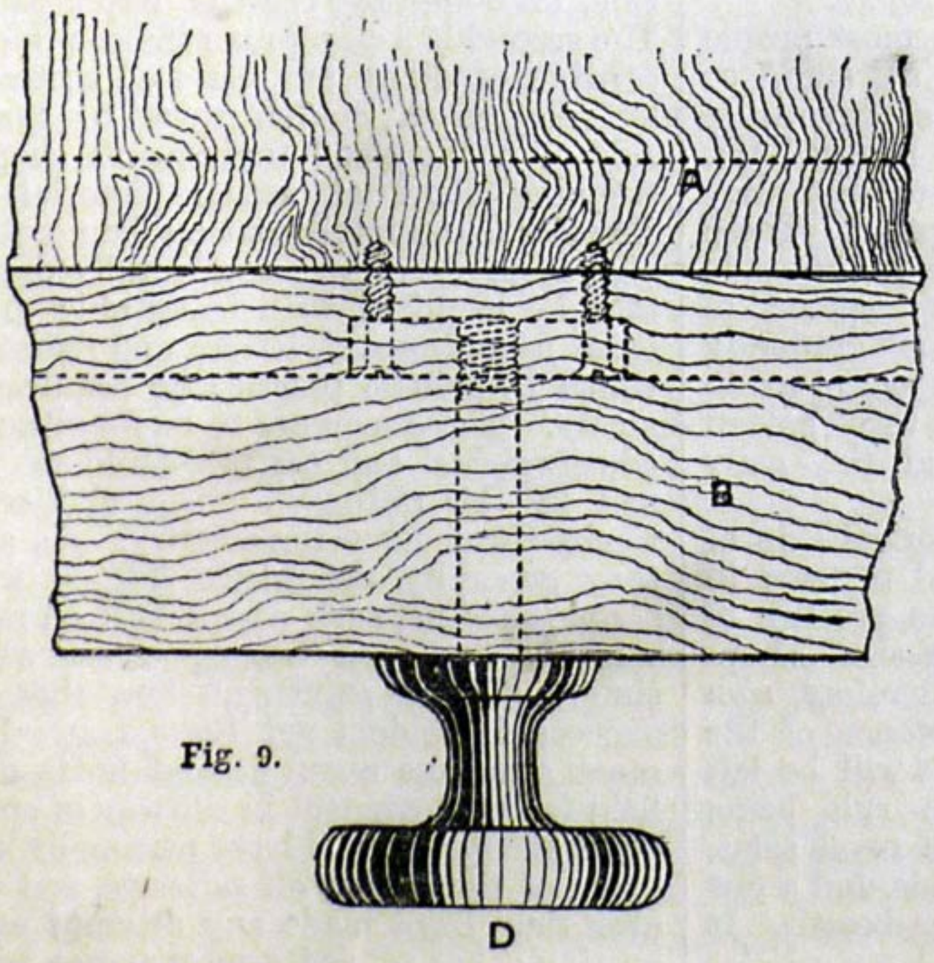

Fig. 9.

Fig. 8 a.

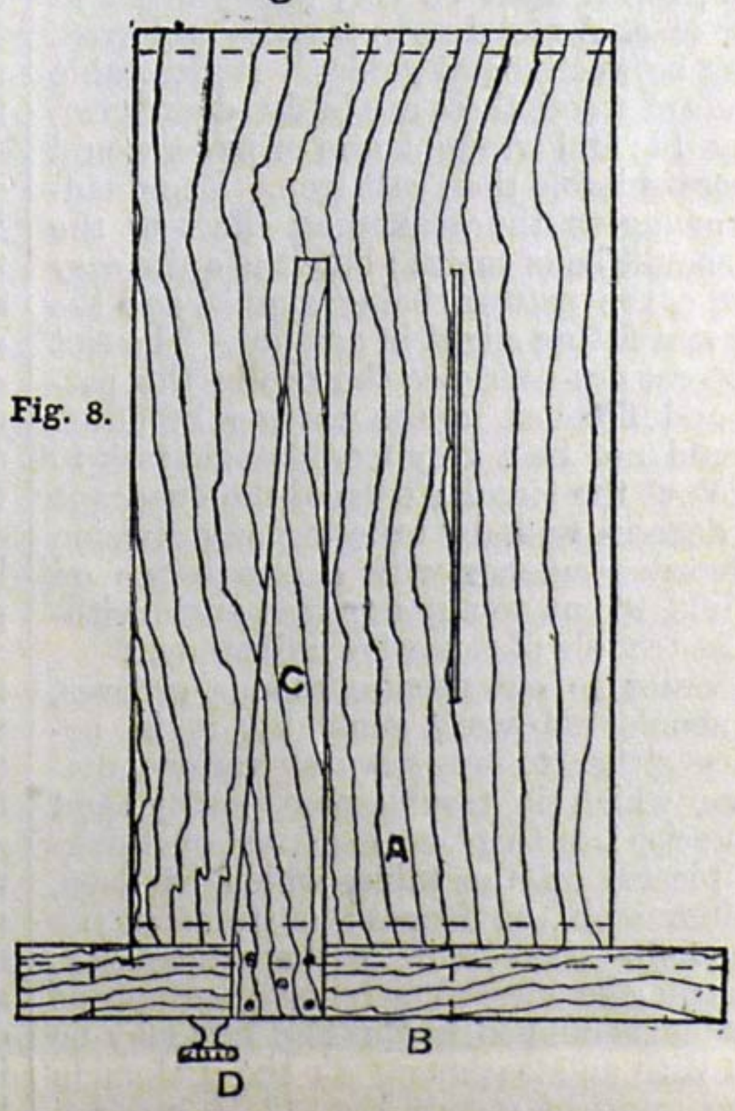

Fig. 8.

Circular-Saw Rigs for the Lathe. Fig. 1.—Brass Spindle for Circular Saw. Fig. 2.—Wooden Spindle for ditto. Fig. 3.—Steel Spindle for ditto for Point Centres. Fig. 4.—Iron Table and Fence. Fig. 5.—Plain Table for T Rest. Fig. 6.—Attachment of Table to Shank. Fig. 7.—Wooden Table for Lathe Saw, Hinged: Front View. Fig. 7 a.—Ditto: Side View. Fig. 8.—Wooden Fence in Plan.—Fig. 8 a.—Ditto: Side View. Fig. 9.—Pinching Screw shown in Fig. 8 on Enlarged Scale. Fig. 9 a.—Ditto in Section.

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wooden table like Fig. 7. The table, A, is grooved along the front edge to receive the tongue of the sliding bar, B, to which the guide, C, is attached. This is clamped in any position by means of the set screw, D, which is tapped into a brass plate sunk and screwed into the tongue piece on A, a slot in the bar, B, allowing the latter to traverse freely over the screw. The screw attachment is shown enlarged in Fig. 9. This, if well fitted, forms an efficient guide.

Another fence is shown in Fig. 10, which may be fitted either to a wooden or to an iron bench, and which can very well be made of two pieces of any hard wood screwed together. The gluing and screwing of the dovetail slip, A, on the under side of the fence stiffens the base, which would otherwise be much weakened by the cutting through of the slot for the thumb screw. The dimensions given are proportionate and approximate only.

Perhaps the greatest advantage of the application of small circular saws to the lathe lies in their adaptability to the cutting of bevelled and polygonal faces. The lathe saw is essentially an amateur's tool, and the more it can be utilised the better. By devising suitable arrangements, much work which would otherwise have to be done with chisel and plane can be saved. Mitred and bevelled joints, rebates, grooving, tenons, and much beside, can be cut with rapidity and accuracy; and the very fine teeth of saws from three to seven inches in diameter will, if kept in order, leave the surfaces clean and smooth.

To do bevel sawing at right angles with the table, it is clear that the piece of wood being cut must not, when set at the angle required, be slid along the face of the fence, but that the fence and the wood must move together parallel with the saw. Hence the purpose of the arrangement in Fig. 11, where A is a V groove cut in the saw table, parallel with the slit, to receive the sliding piece, B, on which is pivoted the quadrant fence, C, capable of being slewed to any angle, and pinched with the thumb screw. The sliding strip may be of hard wood or of metal; but it must be very neatly fitted in either case. A metal strip is to be preferred, sliding between metal guides. If the table is made of wood, these can be fitted as shown in Fig. 12; and wrought iron or brass would be more suitable than cast iron. The quadrant, owing to the weakening effect of the slot, should be of metal; but it is quite easy to make, the pattern being simple, and the filing and fitting slight in amount. The slot can be cut out nearly to the size in the pattern, and finished in the casting by filing. It would not be a very troublesome task to divide out the circular edge of the quadrant into degrees, and, by bringing any division into correspondence with a centre line on the slide, to cut to any required angle without the trouble of tentative adjustment.

In order to cut rebates, tenons, grooves, and shouldered work generally, it is necessary either to use saws of various diameters, which is troublesome, costly, and not precise; or to place blocking, or thickness pieces, on the table, which, if deep, interfere with the fences; or to raise the table itself. The latter is the proper way, and it may be effected as follows:—Suppose the table is hinged, as in Fig. 7, it may be fitted with an attachment on the underside at the front of metal, Fig. 13, A being a slotted quadrant screwed to the table, and B, a piece screwed to the face of the box, into which the set screw, C, is tapped. This is a neat and exact mode of adjustment.

A rougher method is shown in Fig. 14. Here the table, instead of being hinged, is dropped in place simply by means of four pieces, A, fitting between the frame, the strips, C, being added to keep the table from shifting sideways. The pieces, A, are tenoned into the table, and by making them sufficiently long, there is room to permit of the parallel thickness pieces, B, B, being laid upon the top of the frame. A supply of strips of various thicknesses can be kept in readiness for use. The pieces, C, keep the table sideways.

To cut tenons and rebates it is only necessary to adjust the height of the table until the saw stands above it to the same distance as the depth of rebate required—to adjust the fence, and run the stuff along. (Fig. 15.) Then readjust the fence and table, and run the second cut along to meet the first, so removing the piece, A, at once. For doing work of this kind in quantity, the lathe saw is invaluable.

Lastly, the bevel sawing of long stuff is done by means of a canting fence. Fig. 16 shows a plain form made in metal, the construction of which is so easy that no amateur need be without it. In the absence of such a fence, blocks of wood cut to various definite angles would have to be made and placed against the rigid fence. In Fig. 16, two lugs, A, A, are cast on the base, and two, B, B, on the fence. These are united freely with pins. The quadrant piece, C, screwed to the fence, furnishes, with the set screw and the upright attachment, D, the means of adjustment for bevel. The guide strips, E, E, fit in the groove in the table, and a set or pinching screw (not shown) passing through the lug, F, holds the table down in any position.

SIGN WRITING AND LETTERING.

BY HENRY L. BENWELL.

I.—Introductory.

There can be no doubt but that the use of "signs," as a means of advertising, is of the most ancient origin; in fact, it is known that in old Rome the taverns had signs, and that the Greeks also made use of them, as is proved by the frequent allusions made by the old Greek writers on the subject.

In mediæval England, when most people could neither read nor write, a "sign," or "sign-board," was an absolute necessity to the tradesman, and in the reign of Henry VIII. almost every house in street, lane, and alley exposed a sign of some description. These signs were generally indicative of the trade carried on within. With the spread of education, however, these "signs" gradually fell into disuse, although many are in existence to the present day, as the three golden balls of the pawnbroker, and the gaily painted pole of the barber.

It is not, however, the historical side of the subject on which I intend to treat in the present paper, but on the practice of the modern art of lettering on signs, shop-fronts, walls, vehicles, etc. Therefore, *sign painting*, in the proper acceptance of the term, as an almost obsolete art will be left untouched, exception to this rule being made only in the case of the royal arms, arms of public companies, shields, and a few of the most general of hotel sign-boards. It is for this reason I have headed my articles "Sign Writing and Lettering" in contradistinction to "Sign Painting," which title, to say the least, is somewhat misleading. Indeed, the naming of this art—for art it is, although perhaps partly mechanical—has invariably been a sore point with all previous writers on the subject, but, for my own part, I unhesitatingly say that the correct description of the work, as practised at the present day, is to be found in the title of these articles.

There are very few men at the present day who undertake this class of work who could paint a subject on a sign-board; and this can hardly be wondered at, as the man who does such work must of necessity be a first-class artist. This reminds me that some of our most celebrated artists have, on occasions, not thought it beneath their dignity to paint a sign. A specimen of Hogarth's work is, I believe, still to be seen inside "The Mischief" in Oxford Street, near to Soho Square, and an engraving of it used to be exhibited in the window not very long ago, if not at the present day. This, the old sign of the house, is said to be Hogarth's handiwork, and is specified as such in the lease of the house. Catton, one of the original members of the Royal Academy, and Wade, its first professor of perspective, worked occasionally for the London innkeepers. The latter painted a full-length portrait of Shakespeare, five feet high, for a publican, whose house was at the north-west corner of Little Russell Street, Drury Lane. George Morland, I believe, painted more tavern signs than any other artist of note. David Cox, it will be remembered, painted a sign for "The Royal Oak Inn" at Bettws-y-Coed in Wales, which has since been the cause of litigation in the Law Courts, and only lately decided. At Wargrave-on-Thames, midway between Henley and Twyford, and hard by Sir Morell Mackenzie's country seat, is a quaint, old-fashioned inn, the "St. George and the Dragon," the sign of which was painted by two great artists; in fact, to be correct, that side of the sign-board on which St. George is charging the dragon was painted by Leslie, and the reverse side was painted not by Watts, as has been sometimes asserted, but by Hodgson.

By what I have said, therefore, it will be seen that there are three distinct classes of work and workers, viz., sign painters, sign writers, and the common letterers. The first is an artist pure and simple, capable also, as a rule, of doing any class of letter painting. The second is a clever man in his profession, capable of doing any class of writing and lettering, from church work to the outside of a West-end tradesman's shop, but stopping short at actual pictorial work. The last is the intelligent mechanic, who, in nine cases out of ten, accidentally discovers that he is gifted with being able to make exact formations of letters and figures, and which by a little practice he acquires to a nicety. These men are to be found in large wheelwrights' and carriage-builders' yards, and in the railway carriage and waggon works throughout the country. As a rule, they generally use block letters, with a simple shading, such as one sees on railway waggons and coal trucks. This work is simply "letter painting," and those who execute it seldom get beyond it. It has much sameness about it, and holds out no field for improvement in the way of spacing, style, and display. I have personally known many of these men on railways, and whenever they have made any attempt at sign writing it has proved a most signal failure; whereas had they received a little training from a practical man they would probably have soon been enabled to execute their work with credit. But I have knowledge also of two cases where men have possessed

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a remarkable "gift" for this work—one in general sign writing, the other in "lettering" waggons. The sign writer, a homeless, shoeless, drunken vagabond, is still alive. He cannot read nor write, yet he can paint a sign with ornamental borders and letter it in any style, without mis-spelling a word or making the slightest mistake. His charges are absurdly low; he is generally in a half-drunken condition, and his couch at night time is more often than not the floor of some out-house. This is one of the worst cases of a mis-spent and ill-directed life it has ever been my lot to witness. In the other man the aspect of the case was just reversed; he was a mechanic of the roughest order, a waggon repairer, but honest, frugal, and sober. Whenever occasion called for it, he would employ the sign writer just alluded to to re-letter a truck or waggon. Cheapness was no doubt his reason for getting his work done by such a man, who, moreover, frequently disappointed him. One day the waggon repairer—whom I had noticed frequently standing for hours watching me at work on a waggon—came up to me and asked, politely enough, how I had learnt the art of forming letters, or, as he put it, "Painting them 'ere letters on waggons?" I told him that I was self-taught, my only guide being a half-crown handbook on the subject. "Could I tell him where he could get the book?" "Oh, yes," was the reply, and I entered the office and gave him the publisher's address. It may scarcely be believed, but within a fortnight I saw that man lettering a railway waggon, and forming letters to such a degree of nicety as to put even myself and the drunken professional writer "in the shade."

These cases may help to illustrate the way in which a great majority of men drift into becoming sign writers. As in all other trades and professions, it is often a matter of chance. But these men can hardly ever hope to become clever and proficient in their chosen walks of life; they have not studied the rudimentary principles of the work, have not started at the bottom rung of the ladder, and do most of their work without knowing the why and the wherefore of each individual process.

It is not, however, this class of workman which we want in the coming generation—we must endeavour to make him something better; and now that he has found a fitting tutor and guide in WORK, he will have only himself to blame if he sinks in striking out for fame in the struggle of life.

In the succeeding chapters on Sign Writing it will be my earnest endeavour to take the student through each successive course in the easiest possible stages, commencing at the very root of the subject. It must not be inferred from what I have already said that it requires a gifted nature to properly acquire this art; on the other hand, with proper and methodical training it is within the reach of all. Indeed, towards the close of my subject I hope to show how the more simple styles of plain lettering may be carried out by almost mechanical means. These instructions, however, are principally intended for those who follow some trade in which a little lettering is sometimes required, but which the workman has not a chance to learn except by properly following up the course of instruction as laid down in these pages.

Having briefly surveyed the general aspect of the subject, I will, in my next, commence the practical part of our work.

(To be continued.)

THE KALEIDOSCOPE: ITS CONSTRUCTION AND APPLICATION.

BY THOMAS RICHARDSON.

I.—THE SIMPLE KALEIDOSCOPE.

THE "tube of ten thousand flames." Such was the title applied by the Chinese to the instrument which forms the subject of this paper; and certainly the title appears to be most appropriate and suggestive when we take into consideration the myriads of pictorial views it is capable of producing. The peculiar name bestowed upon it by its distinguished inventor, Sir David Brewster, is derived from three Greek words, signifying "beautiful," "a form," and "to see." When first introduced to the public, about the year 1818, it is recorded that the effects produced by its wonderful qualities created such an extraordinary sensation both in this country and abroad that immense numbers were hastily constructed, and cargoes of them sent to foreign and distant lands, copies having been met with in the most remote districts of Switzerland.

It is not my present purpose to enter into a disquisition on the principles of the kaleidoscope, but merely offer a short explanation to assist the reader in comprehending the nature of the various parts of the instrument, and then pass on to consider its construction in its simplest form and after a fashion which may be reasonably supposed to lie within the province of any intelligent amateur capable of using a soldering bit or wood-working tools, and wishful to provide a source of amusement for the younger, and, for the matter of that, the older portion of the family circle during the long winter evenings.

The kaleidoscope consists essentially of two pieces of glass, which may be oblong or tapering in form to suit the fancy of the maker. These are secured and supported at any angle which forms an *even*, aliquot part of a circle, in a suitable tube, at one end of which is a cell termed the object box, formed of two circles of glass, the inner one being clear, and the outer one of ground glass; these are kept apart about $\frac{1}{8}$ of an inch by means of a ring of brass or other suitable material so as to enclose between them a number of coloured and clear pieces of glass, etc. The opposite end of the tube is closed with a cap in which is a small aperture at which the eye is placed in order to view the pictures presented by the several reflections of the fragments of glass in the object box.

As wood workers undoubtedly predominate amongst the readers of WORK, I propose to treat the subject first from this standpoint as shown in Fig. 1. On inspecting the Fig., it is obvious that access to a lathe will materially assist the worker, or, if this is not possible, the cap and the flanged collar at the back of the object box may be obtained for a trifle from any turner.

To proceed, first turn or otherwise prepare a mandrel or cylinder of wood about a foot long and 2 inches diameter, on which to prepare a tube of paper; rub a little grease over 10 inches of its length as a precaution against the paper being glued to the wood. Cut out a strip of stout cartridge or brown paper, say 3 feet long and 9 inches wide, up to 3 inches from one end, where it should have a projection of an inch at each side, making 11 inches wide for the last 3 inches; set off 6 inches from this wide end, give the remaining portion of the strip a coat of thin, hot glue, fasten the projecting edges of the clean end square along the mandrel, and fold the strip tightly round it, pressing out with a cloth any excess of glue, so as to finish with a smooth surface. After standing aside for a day to dry, it will now require the ends cut true, and the best way to do this will be to fold a half sheet of note paper round the tube about $\frac{1}{2}$ an inch from the end and run a sharp knife neatly round close to the edge of the note paper; then treat the other end in the same manner, so as to leave the tube 8 inches long, and slip it off the mandrel.

We next require two circular pieces of mahogany $\frac{1}{4}$ of an inch thick to fit each end of the tube, having a portion removed as indicated in Figs. 2 and 3 to an angle of 60 degrees, which angle may be easily obtained by dividing the circumference of a circle into six equal parts.

The reflectors measure 8 inches in length, and are $1\frac{1}{2}$ inches wide at one end, and $1\frac{3}{16}$ inches at the other. They may be cut from mirror glass or from plain clear window glass, moderately thin, say 16 oz., and the backs prepared by giving them a coat of drop black mixed with varnish, and a little terebine to accelerate its drying, or even black varnish will do for the purpose. When dry, the reflectors are now ready to be placed in the tube and secured in position by a piece of stout card cut to fit round the curve and meet at the edges of the reflectors. Before placing the card in position, it should have a piece of dead black paper pasted on the inside or by giving it a wash with Indian ink.

The next step is to provide a cap for the eye, and this may be achieved in the lathe by hollowing one side to a depth of $\frac{3}{8}$ of an inch to fit outside the tube, with a clean cut aperture in the centre $\frac{3}{8}$ of an inch diameter, then to reverse the work by turning down a piece of wood on a chuck to fit the recess, and finish off the outside as shown in section, full size, in Fig. 4.

The object box may also be constructed of wood in the manner shown in section and elevation, Figs. 5 and 6. A piece of hard wood, preferably of mahogany, 4 inches square is trued up to $\frac{3}{16}$ of an inch thick, and an opening cut or bored in the centre $2\frac{1}{2}$ inches diameter; a recess $2\frac{3}{4}$ inches diameter and $\frac{1}{16}$ of an inch deep is further produced on one side in which to insert a circle of thin, clear glass; a cap is next turned with a flange and bored to fit outside the tube at the object end. Fix the glass in the recess by means of a red-hot wire applied to a few tiny pieces of marine glue laid round the edge, and secure the flanged cap centrally to this square piece with 4 screws, being careful not to split either in so doing. On the opposite face are also screwed two narrow strips $\frac{1}{2}$ an inch wide and $\frac{1}{4}$ of an inch thick, one piece along each edge and across the grain to prevent warping; between these two strips another piece 4 inches by 3 inches and $\frac{1}{4}$ of an inch thick is hinged, and provided with clips to keep it in position; this is also fitted with a piece of ground glass, as shown, on the inside, with the ground face of the glass outwards. The foregoing method of constructing the object box admits of the easy removal and change of the fragments of glass, etc.

To those who may prefer to take the alternative course, I may remark that the taper form is usually adopted when the tube is of tin plate. Still keeping to the same length and the same diameter at the object end, I propose to taper the tube to $1\frac{1}{8}$ inches at the eye end. The plate requires to be cut to the form seen in Fig. 7. First secure the plate by the corners with tacks

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to the bench or floor, and make a trammel to draw the large circles by driving a couple of wire nails through a lath 18 inches apart. Make the centre nail secure, and scribe a circle, A, B, on the plate as shown; now shift the outer nail 8 inches inwards and scribe a second circle, C, D. With a pair of compasses set to 1 inch mark six divisions along the line, A, B, and scribe lines through the first and last points towards the centre. Outside the figure thus formed, a space about ¼ of an inch wide must be set off to allow for the joint. Having cut the plate neatly to the lines, bend about ⅛ of an inch along each edge slightly downwards over the edge of a block of hard wood, both edges one way; the underside will then form the inside of the tube, and the plate must now

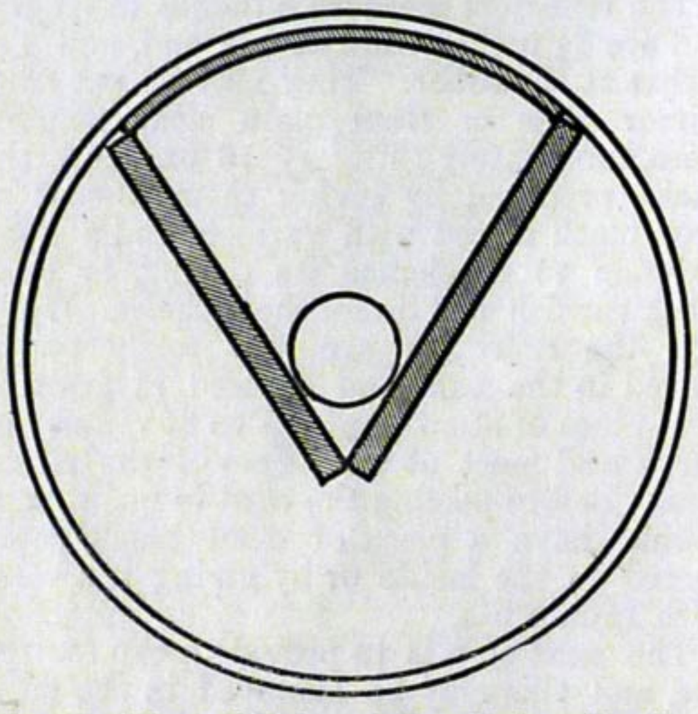

Fig. 2.—Plan of Tube at Eye End, with Cap Removed (full size).

be gently bent or beaten with a smooth-faced wood mallet, round a mandrel having the same dimensions as the inside of the proposed tube. It now only remains to secure the plate on to the mandrel with a piece of wire twisted round in two or three places, solder the joint, and the tube is complete.

The reflectors for this form are 1½ inches at the object end, and taper to ¾ of an inch at the eye end; for the third side I should still advocate the use of cardboard as in the cylindrical form, but it may consist of a similar piece of glass or a piece of thin wood blackened on the inner side. In order to bring the aperture in the cap at the eye end into a central position as regards the tube, it will still be necessary to raise the narrow end of the reflectors into the most suitable position for the eye, in its relation to the reflectors. This support is shown in elevation in Fig. 8, and may be formed of tin plate with the edges turned back where they come in contact with the glass. The same course must be taken with the object end, as in Fig. 3, securing each support with a drop or two of solder. It will be best to form the cap in wood, and perhaps the

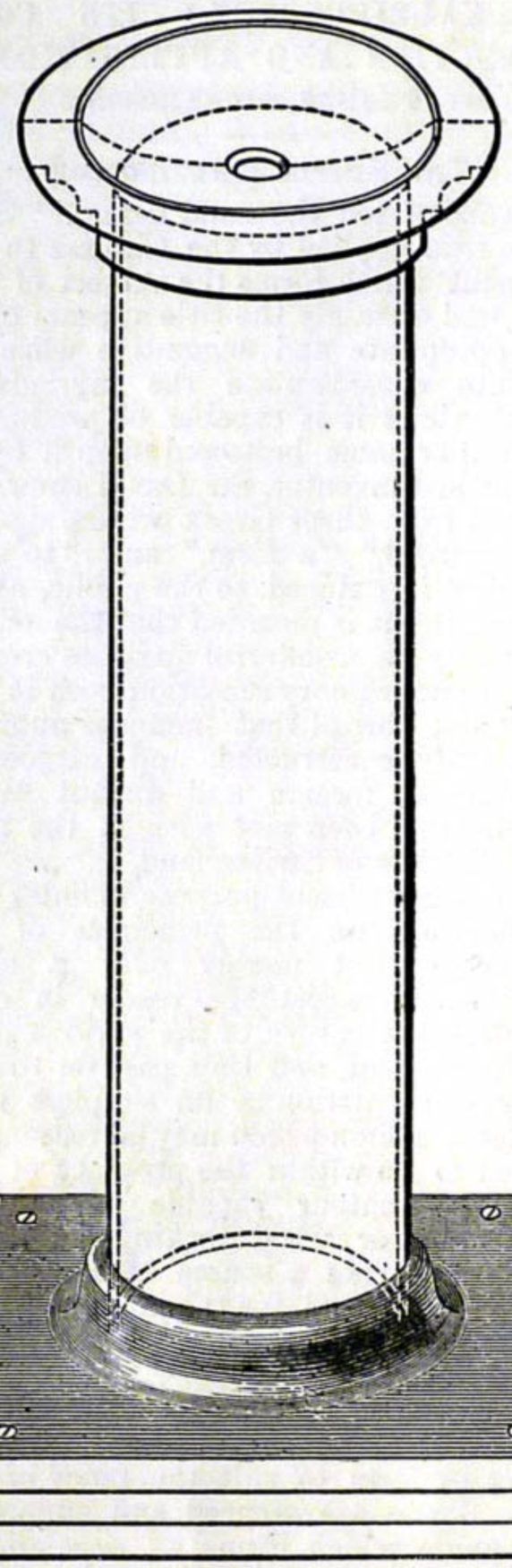

Fig. 1.—View of Simple Kaleidoscope, with Parallel Paper Tube (half full size).

same may be said of the object box; but if this is not desirable it may be made of a strip of tin plate ¾ of an inch wide, formed into a collar to fit outside the tube, and one edge turned over about $\frac{1}{16}$ of an inch all round to support a circle of ground glass cut to fit the interior; over this glass is placed a brass ring ⅛ of an inch thick, neatly curved to the circle, and made to spring in somewhat tightly. The objects chosen are now introduced, and a circle of clear glass resting on the ring is laid over them; the box with its contents is then slipped on to its place, and by way of embellishing the tube and attaching the box to the same, a piece of wall paper of a small, neat pattern is selected and pasted over the whole length of the tube, the object box included. Now glue the cap to the paper cover and the instrument is complete.

Respecting the choice of colours, blue, green, and yellow will be found most suit-

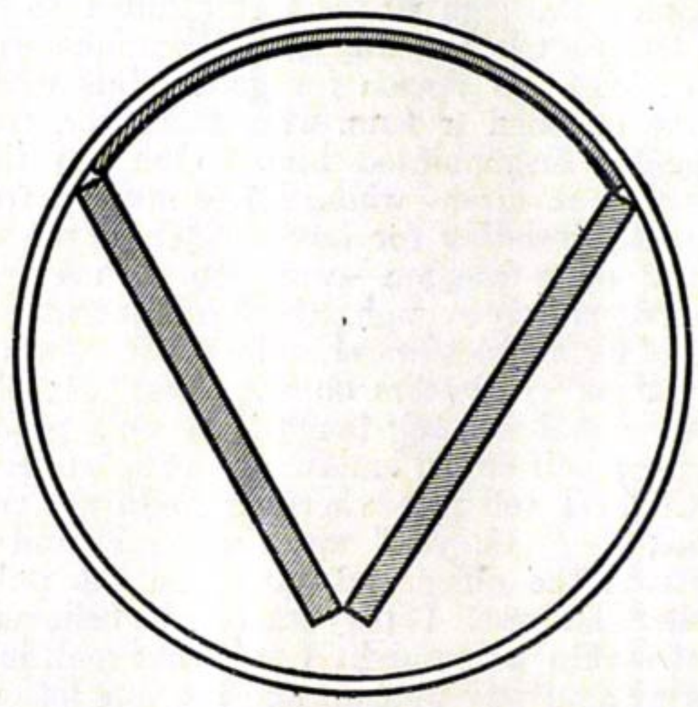

Fig. 3.—Plan of Tube at Object End, with Object Box Removed (full size).

able, always selecting pale tints in preference to opaque objects. Colourless fragments may also be introduced, together with the coloured glass, with effect.

The symmetry and beauty of the picture or patterns produced, and consequently the pleasure derived from the contemplation of them, will depend principally on the degree of accuracy attained in adjusting the reflectors to the correct angle, which may be tested by having but one piece in the object box, large enough to occupy a considerable portion of the field, say one-third, when the observer will notice there are six views ranged round the angular point formed by the junction of the reflectors. Each section should then be apparently of the same size, and their adjacent edges coincide with each other. The images being reflected from the posterior surfaces of the reflectors, this interferes very considerably with the perfect form of the patterns, but this defect will be obviated in the instrument to be described in future chapters. This instrument, it may be said, is the invention of the writer, and will tend, it is hoped, to render the kaleidoscope of greater practical utility than heretofore.

(*To be continued.*)

Fig. 8.—Section of Eye End of Taperform Tube, with Cap Removed (full size).

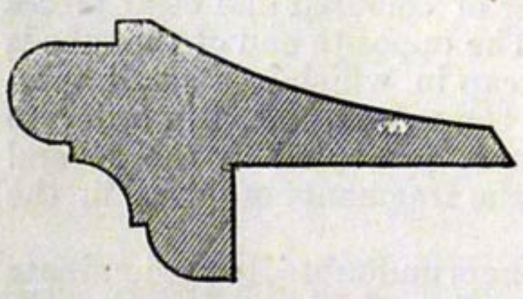

Fig. 4.—Section of Cap for Eye End (full size).

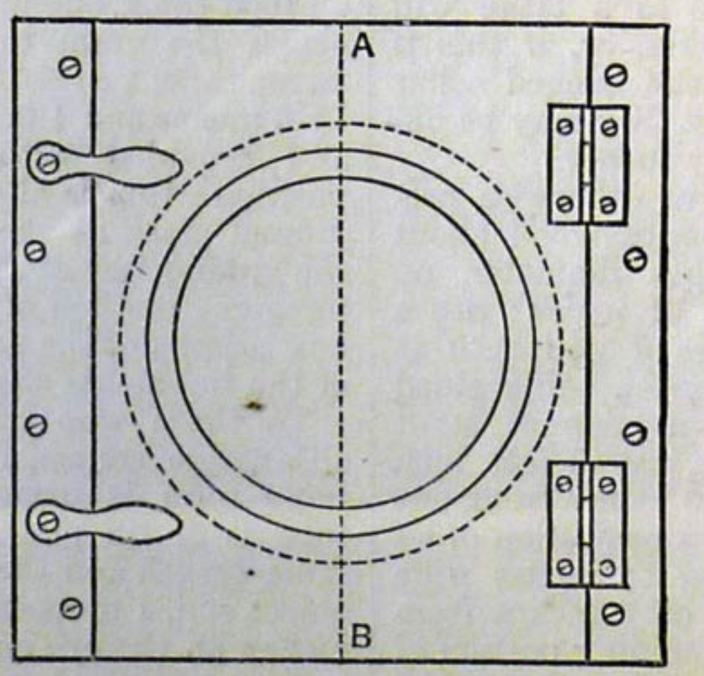

Fig. 6.—Plan of Object Box, with Glass Removed, showing Construction of Top (half full size).

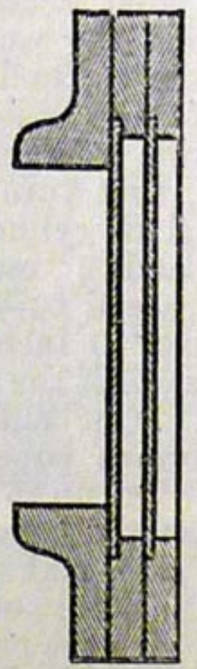

Fig. 5.—Section of Object Box on Line, A, B, Fig. 6 (half full size).

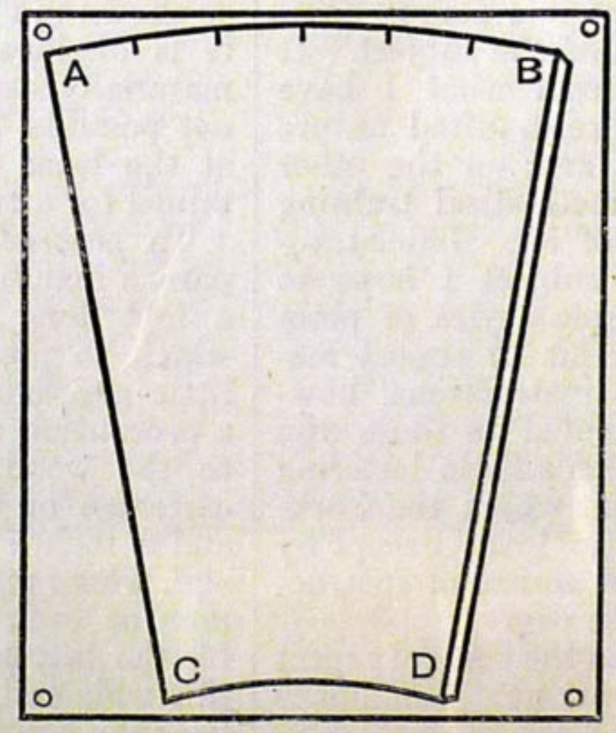

Fig. 7.—Mode of Setting out Plate for Taper Tube (one-fourth full size).

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OUR GUIDE TO GOOD THINGS.

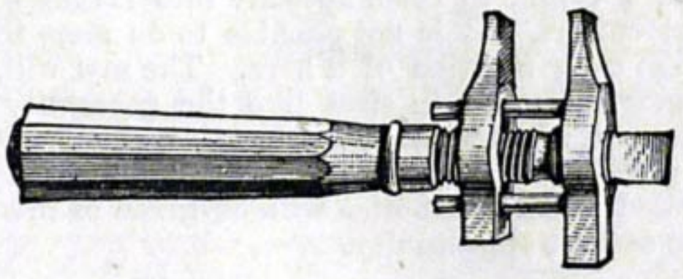
INTRODUCTORY.

MANY a workman, unfortunately, misses the chance of obtaining some special tool, machine, or appliance that may be of the utmost use to him in his particular calling, because he may not have seen it, or even heard of it, in the locality in which he lives. Show a man a new tool with which you have recently provided yourself, and it often happens that he will say, "Why, where did you get hold of this? It is the very thing I want, and just what I have been looking for I don't know how long!" And having learnt where the article on view may be had, off he goes, congratulating himself on his good fortune, and buys one at the earliest opportunity.

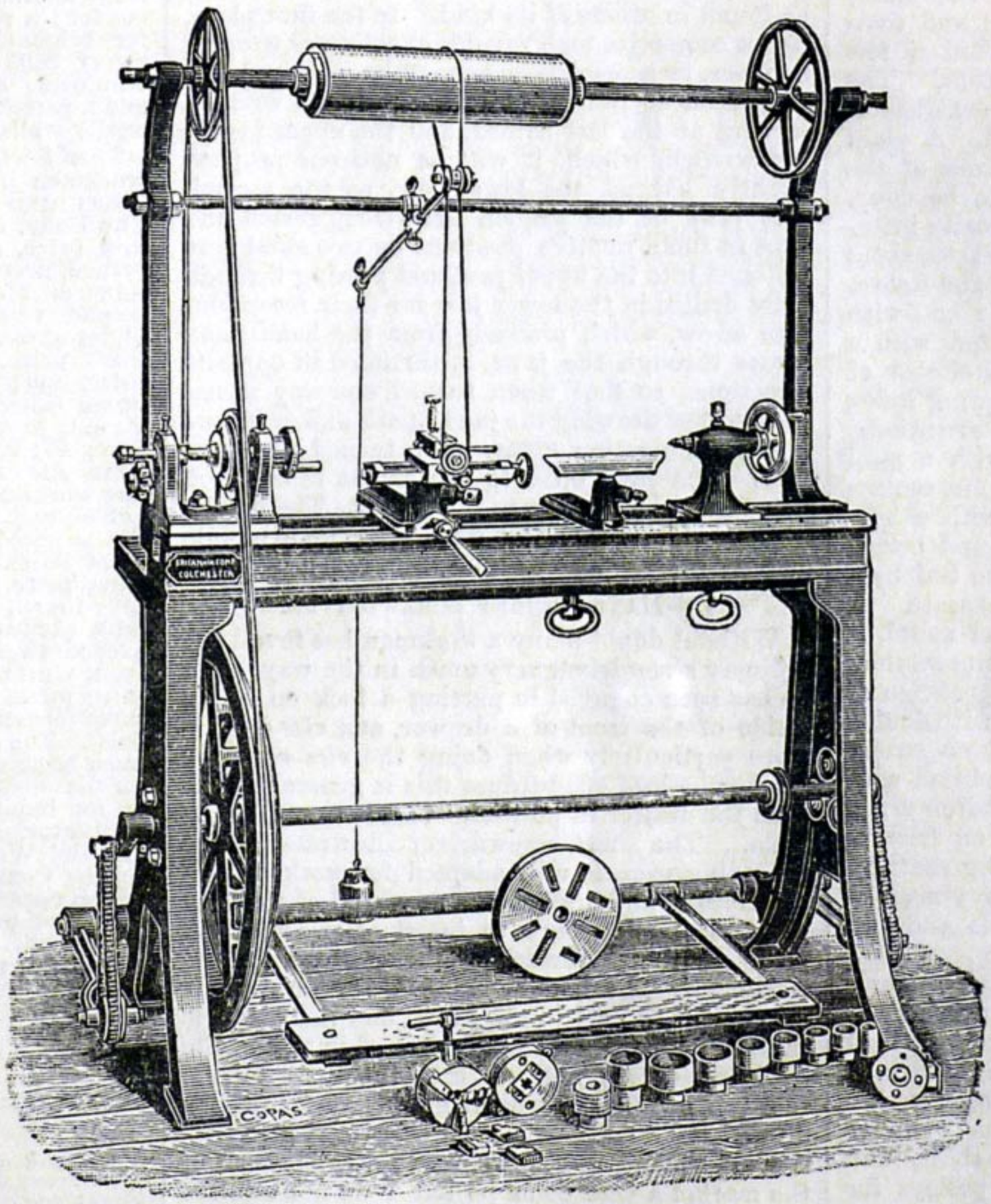
Now, it is in the spirit, and with the hope, of giving such useful and desirable information, week to week, to the readers of WORK that "Our Guide to Good Things" has been set on foot—to make them acquainted, in fact, with the existence of new tools, machinery, appliances, technical works, etc., of which they might otherwise be still in ignorance; and, as it has been said elsewhere, to give timely notice of "all things useful and novel that manufacturers and inventors may produce in the interest of those who labour with the hands." That such notice may be beneficial to those whose productions and goods may be mentioned is obvious to all, but it must not be supposed for a moment that whatever may be advanced here is done in the interest of manufacturer or seller, with the view of directly recommending any particular article, and thus, perhaps, indirectly depreciating another. The names of makers, and of sellers too, must of necessity be mentioned, but in the case of the latter it will be rather to show who has been the first to give information respecting the tool or appliance described, than with any intention of bringing them prominently into notice as sellers of the goods described.

Further, in all notices of articles described in this part of the magazine, it will be sought rather to give a clear and accurate description of the tool, machine, or appliance under consideration, and to point out the purpose it is intended to serve, than to express any authoritative opinion respecting it, leaving it to each reader of WORK to determine for himself whether or not it is the thing he needs, and if it be likely to prove of value to him.

Having thus cleared the way, as appears desirable, in order to avoid any misapprehension, let me ask all manufacturers, inventors, and patentees, under whose notice WORK may come, to supply information with respect to their specialities, that they may receive early mention in these pages; and for the same end let me also ask all dealers, and readers of WORK as well, to send information of any good thing with which they may become acquainted. In the case of small articles, which can be transmitted by parcel post, it is desirable that a specimen should be sent for inspection, as it is impossible to describe any tool clearly and accurately without seeing and handling it. With regard to machinery, lathes, etc., it is requisite that a full and complete description should be sent, or that arrangements should be made with the Editor for its inspection, either by himself or by some competent person. In all cases it is of the utmost importance that an illustration of the article under notice should accompany the description.



Small Parallel-jawed Wrench.



The Britannia Company's New "Lukin" Lathe.

1.—THE "LUKIN" LATHE.

The first piece of machinery that offers itself for description in WORK is the "Lukin" Lathe, a new and useful appliance for plain and ornamental turning, made from the design of the Rev. James Lukin, B.A., a gentleman who has long been known in the mechanical and engineering world as a reliable authority on lathes and everything connected with them. It is manufactured by the Britannia Company, Colchester, Essex, who will promptly answer any inquiries that may be made respecting it. The illustration given herewith affords a good representation of it, and from an inspection of this the reader may obtain a fair idea of its construction and general appearance. It is preferably made, however, either with crank and steel centres, or with improved roller bearings, so as to be readily accessible for cleaning and oiling.

It should also be noted that the lathe may be had constructed with inside cranks and hooks, with the axle upon hardened centres. These details, however, are altogether optional, and will be suited to the wishes of the purchaser.

The lathe, as shown in the illustration, is said to be satisfactory in every respect. The beds are 4, 4½, or 5 feet long, the length of bed being a variable quantity, so to speak; the centres are 5 inches high. The mandrel headstock is fitted with oil cups; the faces and edges are bright, and the rest japanned black. The mandrel is traversing, with the front neck 1 inch and the other ⅝ inch, both working in collars of hard steel, or of phosphor bronze if preferred. Other dimensions are:—Width across face of bed, 4⅝ inches; depth of bed, 4½ inches; diameter of nose of mandrel, 1 inch; pitch of screw, 8 per inch; diameter of driving wheel, 27 inches. It will be understood from that which has been said above respecting the bed, that the lathe can be had in three sizes in this respect. It is also supplied with gap-bed if desired.

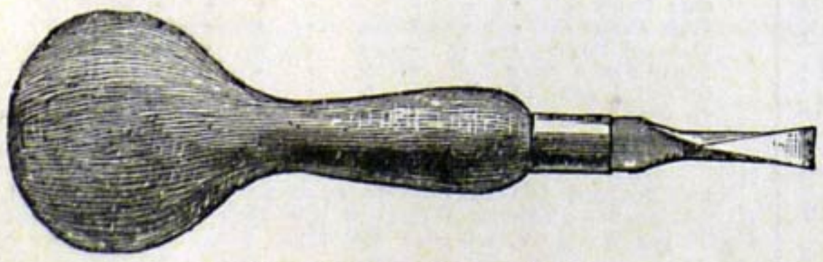
There are six formers, or guide screws, of steel, of the following pitches:—8, to fit the mandrel nose, 10, 12, 16, 24, and 30. These are fitted on in the usual manner, and work in a segment plate. By means of the traversing mandrel with the guide screws, threads may be cut upon telescope, microscope, and other similar fittings, in wood or metal, not exceeding the length of the guides.

The overhead is of the usual kind, with tension rod and pulleys, there being a hollow mahogany roller and a pair of cast-iron pulleys, that on the right being intended to gear with the small one on the crank axle, whereby a very slow motion may be obtained, which is sometimes desirable. The slide rest represented is of a very simple character, and, though good of its kind, is not intended to be taken as the best possible for the "Lukin" lathe, which can be fitted to order in this respect, according to the desire or the requirements of the purchaser.

The lathe was originally designed to meet the general purposes of amateurs who are fond of lathe work, and is therefore made of sufficient strength and substance to admit of rougher usage than usually falls to the lot of an "ornamental" lathe, properly so-called. Thus it will carry a 6 lb. jaw chuck or heavy 10 inch face plate, with large metal turning rest, and, at the same time, will execute fine eccentric work with the utmost accuracy. The range of its capabilities depends, of course, upon the chucks and fittings; but with a drill, eccentric, and vertical and horizontal cutter, an immense amount of beautiful work may be done.

For example, all kinds of plain turning in soft and hard wood can be done, such as boxes with or without screwed covers, tool handles, vases, egg cups, bread platters, butter dishes, needle cases, spill pots, spice boxes, string boxes, ring stands, napkin rings, curtain rings, chair and table legs, pillars, plain or twisted, spindles for overmantels, brackets, etc., watch stands, chains cut out of the solid, metal spinning, etc. etc. All fittings can be screwed by aid of the traversing mandrel instead of being glued together, which is an advantage in many ways.

In ornamental turning, with an eccentric cutter alone, used with the division plate, all simple patterns of interlacing circles may be executed. With the vertical and horizontal cutter, basket



Handy Short Screwdriver.

Patent Brass-capped Bradawl.

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and fluted work can be done. With the eccentric cutter alone, flat faces can be cut, as, for example, the flat sides of a hexagon or a cube, and also a perfect ball or sphere. With the drill, various perforated work of a highly decorative character can be cut, besides fluted work. By the addition of a spiral chuck and dome chuck to the lathe—appliances already mentioned—Elizabethan twist, spherical work, and such-like, may be included in the list of ornamental work done by means of this lathe.

In addition, any brass work, with screwed joints or otherwise, may be turned out, such as microscopes, telescopes, electric bells, the parts of model engines; and a variety of light work in iron and steel may be done, such as screws, nuts, and small bolts, and if castings are obtained the lathe will suffice for fitting up many pieces of mechanical apparatus, chucks, etc.

So much for the capabilities of the lathe, which it will be allowed are numerous and comprehensive. It only remains to afford a few particulars with regard to construction. The fittings of the fast headstock for ornamental turning have been already mentioned. A plain sleeve is provided, to be used in place of the screw former, when plain turning is to be done, or when screw cutting is only temporarily interrupted, a simple device being provided to avoid taking off and putting on screw guide and sleeve.

The cone pulley is made of gun metal with three or four speeds, and its front fitted with a division plate having three or more circles of holes of any selected numbers and a spring index point. A driver chuck and face plate are fitted.

The loose head or poppet is fitted with a steel tubular mandrel, coned at front end for centres and screwed at back end, and fitted with a left-hand square thread traversing screw, and bright turned hand wheel, and secured to the bed by a through bolt-and-bow nut and plate beneath. A plain hand rest, with T's for wood and metal, is fitted. The bed is of cast iron of strong section, without cross ribs to impede the free passage of poppet and rest from end to end, and with double flat face truly planed. It is mounted on strong cast-iron standards. The treadle is fitted with bright turned rocking shaft and cast-iron arms. The bright turned wheel shaft runs on friction rollers, and is coupled to the rocking shaft by chain and roller gearing. The heavy-rimmed driving wheel has three quick speeds and two smaller speeds for slow motion.

The lathe is fitted with a polished mahogany tool board at back. The ornamental overhead is constructed with strong rigid cast-iron (vertical supports as shown, carrying the bright turned horizontal shafts. It has, as it has been said, a turned and polished mahogany drum or cylinder to slide along the upper grooved shaft, and driving wheels with tension rod and pulleys for adjusting the driving gut.

The price of the lathe alone, for plain turning, is £22 10s.; with ornamental overhead motion, £30. A plain slide rest in addition raises the price to £35, and an ornamental slide rest to £40 10s. These quotations are for the lathe with 4-feet bed; for longer beds or gap-bed a small additional charge is made.

2.—New Wire-thread Fret Saw.

I think the readers of WORK will be the first to hear anything about this New Wire-thread Fret Saw, which was shown me a few days ago by Messrs. Richard Melhuish & Sons, 85 and 87, Fetter Lane, London, E.C., and to which, for want of a specific title from the maker, we ventured to assign the above name. Literally this new fret saw is nothing more nor less than a piece of strong steel wire toothed on all sides at wide intervals between the teeth, and presenting the appearance of a piece of wire of extremely small diameter, barbed with small but exceedingly sharp points in every direction. Now the advantage of this peculiarity of construction is that the saw will cut in any direction, backwards, forwards, upwards, downwards, sideways, just as you will, *without any need of turning* the saw handle. Make a single hole with a drill, in the usual way, and insert the saw, and you may cut out the most intricate forms, going into as many points or curves as you will and back again without any palpable change of direction of the saw blade. It is a veritable novelty in fret-saw blades, and cannot fail, I think, to come speedily into favour with fret cutters. It is not possible to do more than make early mention of it here. The saw will, of course, be made in sizes like the generality of fret saws; but with regard to price, about which I particularly inquired, nothing definite is yet settled. Further notice will be given of this at the earliest opportunity.

3.—Small Parallel-jawed Wrench.

There must be few nowadays, it is fair to suppose, to whom a handy pocket wrench has not become a daily requirement, and especially for bicyclists and tricyclists. The Small Parallel-jawed Wrench figured in the preceding page is useful for a variety of purposes, and presents good points in its construction which are not to be found in others of its kind. In the first place, it is a composite tool, capable of acting as wrench, hammer, or screwdriver, as may be required, the projection at the upper end, above the wrench, serving as the last-named, and the upper jaw of the wrench, which, it will be noticed, projects slightly beyond the lower jaw, as the second. The jaws of the wrench are strengthened and kept in their relative positions by two stout bars fastened into the upper jaw, and passing through holes drilled in the lower jaw for their reception. The screw, which proceeds from the handle and passes through the jaws, is threaded in opposite directions, so that when turned one way it has the effect of drawing the jaws apart, and of bringing them together again when turned the other way. The jaws open to the extent of one inch when brought asunder to the utmost. The handle is of wood, and therefore more pleasant to handle on a cold day. The price of the wrench is 3s.

4.—Handy Short Screwdriver.

Without doubt many a workman has found the ordinary screwdriver very much in the way when he has been engaged in putting a lock on to the inside of the front of a drawer, and *vice versâ*—more particularly when doing the *vice versâ*, or taking the lock off, because this is generally done with the drawer in position—that is to say, in the table. The short screwdriver illustrated in the preceding page is well adapted for work of this description, and indeed for any kind of work in which it is necessary to insert screws with the blade of the screwdriver turned towards the workman. The handle being broad and flat is convenient to hold in the hand, and the blade is short and strong, and securely fixed in the handle by being deeply notched into the brass ferrule that is shown in the engraving, between the handle and the blade. This screwdriver is not mentioned as being absolutely new, for it has been in the market a year or more, but I do not think it is widely known, and possibly a knowledge of its existence may be useful to many.

5.—Patent Brass-capped Bradawl.

This is an improvement on the old form of bradawl, which only requires to be known to ensure its general adoption. In the old bradawl the tang of the blade was driven into the handle, and a semblance of strength was given to the tool by the ferrule, whether of brass or iron, with which the upper end of the handle was encircled; and frequently after a little use, when the bradawl has been thrust into a piece of wood somewhat harder than usual, handle and blade have parted company in a most aggravating way when it has been sought to draw it out again, the handle remaining in the operator's hand and the blade in the wood, from which it has been removed by other than the legitimate means. Such a catastrophe, however, may be averted by the use of the Patent Brass-capped Bradawl, in which the upper end of the handle is worked in such a manner into the brass cap that takes the place of the ferrule that the blade is secured in the handle so firmly that there is not the slightest possibility of any separation between the one and the other in the manner described above. Having used these bradawls myself, and found them far superior to the ordinary bradawl, I can recommend them.

THE EDITOR.

Trade Notes and Memoranda.

SOME TOPICS OF THE HOUR.—Street Buildings and Architecture—Architectural Brickwork—Jerry Building Convictions—Ventilation through Walls—Electricity in Raising Water—Liquid Fuel—"Pyrodene," a non-inflammable protection — Tendering for Work in America—Rustless Iron.

LOVERS of cathedral architecture are warned that Rochester's west front is just now underpinned and subject to excavation.—There is to be a new promenade at Morecambe, at a cost of £10,000.—An Architectural and Building Trades' Exhibition opens at the Agricultural Hall, London, from April 1st to the 13th.—New lighthouses and screw piles are shortly to be erected in the Belfast Lough.—The cutting of the Nicaragua Canal is to be commenced at once.—A Manchester designer has just been entrusted with the statue of Godefroi de Bouillon for a niche on the south side of Lichfield Cathedral.—Important additions are about to be made to the Cambridge Natural Science School.—The Lake Scenery District Railway Scheme is coming to the front again.—New patents have lately been taken out for: a painter's stencil holder; a steam press for brick making; a wall embossing method; safety bolts and locks; improvements in balcony windows; a new sash fastener; chimney cowls; and a patent has also been granted for tie bricks for cavity walls.

THE Society of Arts are offering prizes to Art workmen in the following classes:—I. POTTERY (INCLUDING PORCELAIN AND EARTHENWARE). 1. The Body, any material: *a*. Thrown, not shaved, first prize, £5; second prize, £2; *b*. Shaved or turned, first prize, £5; second prize, £2. 2. Decoration: *a*. Modelled and glazed, first prize, £10; second prize, £5; third prize, £3; *b*. Painted under glaze, first prize, £10; second prize, £5; third prize, £3; *c*. Enamel on the glaze, first prize, £10; second prize, £5; third prize, £3. 3. Stone salt-glazed ware: *a*. Plain; incised and glazed, first prize, £10; second prize, £3; third prize, £3; *b*. Coloured or otherwise decorated, first prize, £10; second prize, £3; third prize, £3. The Art workman must have designed the body of the pot as well as have executed the decoration. All the specimens of pottery sent in for competition must be dated on the clay. II. STONE CARVING. First prize, £25; second prize, £15; third prize, £10; fourth prize, £5. The capital of a column, with square, circular, or octagonal abacus, not to exceed twelve inches in width. III. WROUGHT-IRON GRILLES. First prize, £25; second prize, £15; third prize, £5. A grille measuring not less than three feet superficial, nor more than five feet superficial. The object for which the grille is intended must be stated—whether for a protective purpose, for the outside of a window, for a street-door panel, or for indoor use as a window screen, coil case, ventilator, etc. IV. GOLDSMITHS' AND SILVERSMITHS' WORK. [Prizes presented by the Goldsmiths' Company.] A cup or sugar basin of beaten silver, chased or otherwise, made within the year 1888, first prize, £20; second prize, £5. A pendant or brooch, or locket of gold without gems, first prize, £20; second prize, £5. All articles for competition must be sent in to the Society's House, John Street, Adelphi, on or before Tuesday, April 23rd, 1889. The conditions under which these prizes are offered can be obtained on application to the Secretary.

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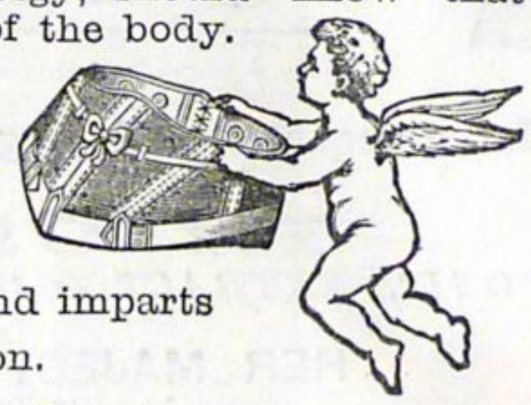

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